This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

World Metric Standardization:

AN URGENT ISSUE

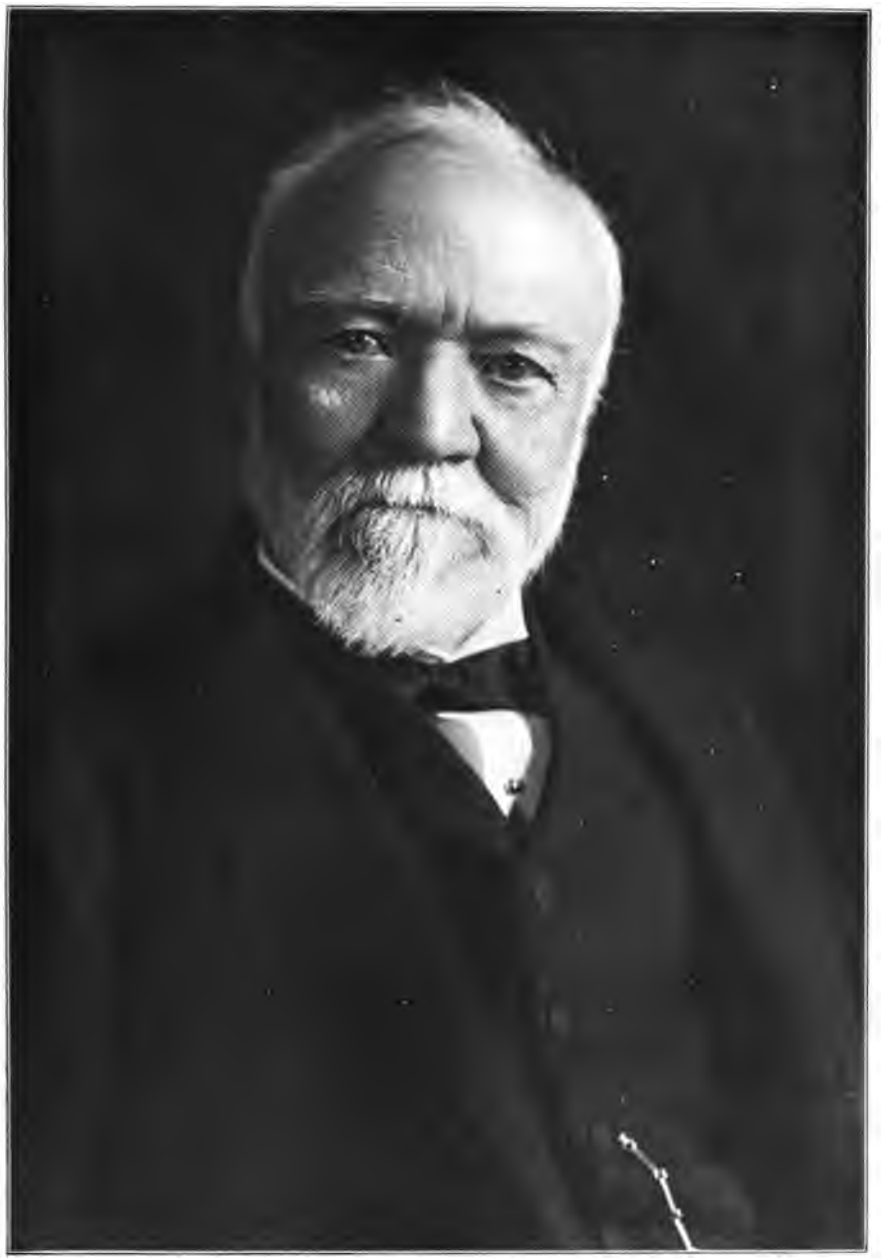
PRICE $5.00

Phys 429.22

HARVARD COLLEGE

SCIENCE CENTER
LIBRARY

ما ۱۴



© Underwood & Underwood, N. Y.

ANDREW CARNEGIE
Pre-Eminent Advocate of World Metric Standardization

WORLD METRIC STANDARDIZATION

AN URGENT ISSUE

A VOLUME OF TESTIMONY
URGING WORLDWIDE ADOPTION OF THE METRIC UNITS
OF
WEIGHTS AND MEASURES—METER-LITER-GRAM

□ □ □

COMPILED BY

Aubrey Drury

IN COLLABORATION WITH CLIFTON HILDEBRAND, W. MORTIMER CROCKER,
HARRY ALLCOCK, M. I. E. E., AND OTHER MEMBERS OF THE
WORLD METRIC STANDARDIZATION COUNCIL

Published by
WORLD METRIC STANDARDIZATION COUNCIL
681 MARKET STREET
SAN FRANCISCO
NEW YORK CITY WASHINGTON, D. C.
UNITED STATES *of* AMERICA
LONDON & MANCHESTER, BRITISH ISLES
MONTREAL, CANADA

Phys 429.22
1.

HARVARD COLLEGE LIBRARY
GIFT OF
CHARLES WILLIAM ELIOT
Nov. 7, 1922

COPYRIGHT, 1922
BY WORLD METRIC STANDARDIZATION COUNCIL
Authority to use and reprint material in
this volume will be granted on application

METRIC UNITS USED THRUOUT THE WORLD

Among the countries (more than 200 in all) which have more or less completely adopted, or use, the metric units of weights and measures, are:

Argentina, Austria, Albania, Algeria, Arabia, Andorra, Archangel, Angola (Portuguese West Africa), Armenia, Azores, Azerbaijan, Abyssinia, Belgium, Brazil, Bolivia, Bulgaria, Benadir (Italian), Balize (British Honduras), Cape Verde Islands, Caroline Islands, Canal Zone, Curacao (Dutch West Indies), China (including Shantung, Kwantung, Fukien, Kiau-Chau, and the treaty ports), Chile (including Juan-Fernandez), Colombia, Costa Rica, Belgian Congo, French Congo, Portuguese Congo, Czecho-Slovakia (including Bohemia, Moravia, Ruthenia), Cuba (including Isle of Pines), Central America (all states), Canary Islands, Cyprus, Crete, Denmark, Danzig (international port), Dutch East Indies (including Java, Sumatra, Celebes, Borneo, Amboyna, Madura, Moluccas, Lombok, and other islands), Ecuador, Esthonia, Eritrea, France (including Corsica and Alsace-Lorraine), Finland, Formosa (Taiwan), Far Eastern Republic, Faroe Islands, French West Africa (including Senegal, French Guinea, Ivory Coast, Dahomey, Upper Senegal-Niger, French Soudan, Mauritania, Sahara, Wadai, Chad, Senegambia, and mandates over recent German territory), French India (Pondicherry and other establishments), Fernando Po (Spanish), Fiume (international port), Guadeloupe, Germany (including East Prussia, Bavaria), Gibraltar, British Guiana, French Guiana (Cayenne), Dutch Guiana (Surinam), Portuguese Guinea, Spanish Guinea, Greenland, Georgia, Greece (including Crete, Ionian Islands, Samos, Smyrna, Aegean Islands, Epirus, Macedonia), Guam, Hungary, Holland (The Netherlands), Honduras, Italy (including Sardinia, Sicily), Iceland, India, Indo China (including Annam, Cambodia, Cochin China, Tonkin, Laos), Japan (including Formosa, Pescadores, Sakhalin), Jugo-Slavia (including Serbia, Montenegro, Dalmatia, Croatia, Bosnia, Herzegovina, Carniola, Styria, Carinthia), Korea (Chosen), Kamerun, Lithuania, Libya (Cyrenaica, Tripoli, Italian North Africa), Lichtenstein, Latvia (Lettonia), Luxemburg, Madagascar, Marshall Islands, Manchuria, Mongolia, Marianne Islands, Mayotte and Comoro Islands (French), Martinique, Mozambique (Portuguese East Africa), Mexico, Morocco, Malta, Mauritius, Macao (Portuguese), Monaco (Monte Carlo), Madeira, Mesopotamia, Nicaragua, New Caledonia (and New Hebrides), New Guinea (Dutch and former German territory), Peru, Poland, Paraguay, Persia, Panama, Philippine Islands, Porto Rico, Portugal, Portuguese India, Pri-Amur Republic, Russia, Rumania (including Bessarabia, Dobrudja, Banat, Bukowina, Transylvania), Rhodes, Reunion, Rio-de-Oro (Spanish), Siberia, Seychelles, Salvador, San Domingo, Spain (including Balaeric Islands), Switzerland, Sweden, San Marino, Samoa, Siam, St. Thomas (Portuguese), St. Pierre and Miquelon (French), Southwest Africa Protectorate (former German Southwest Africa), Soudan, Tahiti (Society Islands, also Tuamotu Islands, Marquesas Islands, and other groups, comprising French Oceania), Trinidad, Tripoli, Tunisia, Timor Island (Portuguese), Turkey (including Constantinople, Anatolia, Kurdistan), Togoland, Tanganyika Territory (former German East Africa), Uruguay, Ukraine, Venezuela, Virgin Islands, Zambesia (Portuguese), Zara (international port).

These countries now practically use metric units, even tho they do not always use **all** the metric units, or the whole system, or all the names. India is a good example of this, using the Ser, standardized at 1000 grams—the Ser of water being the liter exactly. India is also the country of origin of the Hindu-Arabic numerals, on which the decimal metric system is based. (See Index.) China is another example, having definitely decided gradually to turn its 426,000,000 humans to exclusive use of meter-liter-gram.

No country adopting metric units has ever gone back to the scrapt, obsolete units. Of meter-liter-gram it is truly said: **"Once Tried, Always Used."**

Map Showing Well-ni

Countries which all of them now use meter-liter-gram more or less exclu recognized by law and used more than any other units. (See list of all the countries shown here in red use metric units.

Countries which now use meter-liter-gram extensively in many importa physics, astronomy, seismology, botany, mineralogy, metallurgy. IN M pharmacology. Medical departments of U. S. American army and nav divided. For example, U. S. American dollar weighs exactly 25 grams Postal Union, using metric units exclusively. The unit for 1st class r most exclusively in technical schools and in all libraries. IN INDUST electric light, electric heat, electric power). Used exclusively in photography. employ meter-liter-gram. (See firms listed in this book.) IN WORLD TR Metric units used in military maps, range finding, firing data: in ordnance; also Dept., 1918, p. 20.)

In all relations of life, meter-liter-gram are steadily increasing in use.

Countries within the British League which have officially petitioned the New Zealand, Union of South Africa, and India. Canada, which has l tage of Decimal coinage. Metric units largely used in India.

Countries in transition, now making a declaration of independence 1871, taking what was made by our "Jamie" Watt. (What if we, no The countries shown here in black employ metric units for most of t all signs point to prompt adoption of decimal coinage thruout Britannia. United States of America.

Worldwide Use of Metric Units

ly. In 40 important nations they are the only legal units; in over 200 countries they are se countries, preceding page.) In world trade and world war, in science and education,

nd practical fields: IN SCIENCE: Metric units used virtually exclusively in chemistry, DICINE: Used exclusively in medicine; in surgery, dentistry, optometry, bacteriology, e metric units only. IN COINAGE: Use coins of metric weight and measure; decimally 3 mm. in thickness, and 37 mm. in diameter. IN POSTAL SERVICE: Belong to World matter is 30 grams weight. IN EDUCATION: Metric units taught in schools; used al- Metric units used exclusively in electrical industry (telephone, telegraph, radiograph, d metric carat (200 mg.) used by all jewelers. Hundreds of manufacturing concerns To be successful in metric countries, exporters use meter-liter-gram. IN WORLD WAR: rplanes, airplane motors, helium zeps. (See General Order No. 1, U. S. American War

al British government to adopt the world metric units thruout Britannia: Australia, se officially urged metric standardization for all Britannic countries, has the advan-

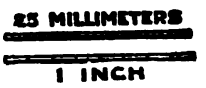
est the obsolete German jumble of weights and measures. Germany scrapt them in g them ourselves, had let Watt's other great inventions thus slip to the Germans?) rposes outlined above, as used by U. S. America and Canada, save in coinage—and ric units are familiar to 10 millions of people in the British Commonwealths and the

THE METRIC SYSTEM

The United States Military Metric "Manual" points out that the metric system is a universal language of measure. It is a language of 10 words, namely, 4 basic units and 6 numeral prefixes:

Name	Value	Meaning	Pronounced	Abbreviation
Meter	1	"Unit of length"	meeter	m.
Liter	1	"Unit of volume"	leeter	l.
Gram	1	"Unit of weight"	gram	g.
Are	1	"Unit of area"	air	a.
Milli	.001	"Thousandth part of"	milly	m.
Centi	.01	"Hundredth part of"	senti	c.
Deci	.1	"Tenth part of"	dessy	d.
Deka	10	"10 times"	decka	dk.
Hecto	100	"100 times"	heckto	h.
Kilo	1,000	"1,000 times"	killo	k.

When the meaning of these 10 words is known THE WHOLE METRIC SYSTEM is learned. The tables of derived units form themselves automatically, and there are no tables to be memorized. 90% of humankind, for practical purposes, need not learn all these names. All they need is METER, LITER, GRAM, all, like the dollar, used decimally.



Why not use the following, already standard thruout the world?

World ton	**1,000,000 grams**
World 100 weight	**50,000 grams**
World pound	**500 grams**
World ounce	**30 grams**
World quart	**1 liter**
World yard	**1 meter**
World inch	**25 millimeters**
World mile	**1,000 meters**
World foot	**⅓ meter**

Petition your national legislators **now**, urging metric standardization of weights and measures.

THIS VOLUME IS WITH REVERENCE AND RESPECT

DEDICATED

TO

JAMES WATT

WORLD'S GREATEST ENGINEER

James Watt, whose genius made possible to humankind the steam engine, steamboat, steam railway, steam pump and steam turbine—

James Watt, in whose honor world electric science has named the electric unit of power, the **Watt**—

James Watt, the first to invent and to get put widely into public use the plan on which are based the 4 world decimal units of measurement, now known as

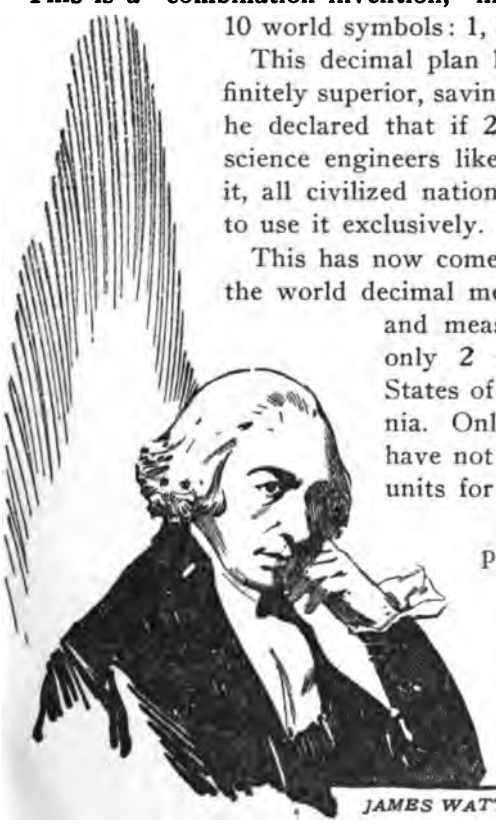
DOLLAR - METER - LITER - GRAM

This is a "combination invention," interlocking with those 10 world symbols: 1, 2, 3, 4, 5, 6, 7, 8, 9, 0.

This decimal plan he knew to be so infinitely superior, saving so much waste, that he declared that if 20 other business and science engineers like himself only USED it, all civilized nations would surely come to use it exclusively.

This has now come true—excepting that the world decimal metric units of weights and measures are slighted by only 2 nations — the United States of America, and Britannia. Only his native folk alone have not adopted these logical units for exclusive use.

To advance the prompt adoption of the world decimal metric units by the United States of America, and by Britannia, this book is printed.



JAMES WATT

TABLE OF ILLUSTRATIONS

Map Showing Wellnigh Worldwide Use of Metric Units ..... Frontispiece pages

Andrew Carnegie ..... Frontispiece pages

PAGE

James Watt 3

Collaborators in the World Metric Standardization Council 64

Albert Herbert, W. H. Hammer, C. W. Eliot, William C. Redfield, John J. Arnold, General Hunter Liggett, Howard Richards, Burgess Darrow, Robert E. Swain, Clancey M. Lewis, Luther Burbank, Sir Frank Popham Young.

Some Prominent Members of the World Trade Club 65

Ben C. Dailey, C. E. Hydes, H. W. Glensor, James G. Decatur, E. G. Babbitt, William E. Hague, G. I. Kinney, John H. Gerrie, Arthur R. Bird, N. A. Davis, C. A. Maydwell, H. N. Thomas.

National Legislators Among Those Favoring Metric Standardization 160

J. S. Frelinghuysen, Duncan U. Fletcher, Arthur Capper, William B. McKinley, A. A. Jones, Robert L. Owen, G. W. Norris, William S. Kenyon, Julius Kahn, A. J. Sabath, Capt. Albert Johnson, S. S. Arents.

Pre-Eminent Men Who Worked For World Uniformity of Coinage, Weights and Measures 161

George Washington, Thomas Jefferson, James Madison, Benjamin Franklin, Alexander Hamilton, John Quincy Adams, Gouverneur Morris, Robert Morris, Sir John Lubbock, James Watt, Charles Sumner, Andrew Carnegie.

Eminent Metric Urgers 256

William G. McAdoo, Otto H. Kahn, Harvey W. Wiley, Samuel Gompers, William B. Wilson, John Lind, F. H. LaGuardia, David Prescott Barrows, Frank L. Polk, Thomas A. Edison, Benedict Crowell, David Starr Jordan.

Practical Men Who Have Urged Meter-Liter-Gram 257

Lord Kelvin, Sir Vincent Caillard, Sir Hiram Maxim, Theodore N. Vail, George W. Perkins, J. W. Alexander, Theodore Roosevelt, Champ Clark, Leonard Wood, John Hays Hammond, Henry Ford, Nicholas Murray Butler.

Members of Editorial Committee, World Metric Standardization Council 352

Aubrey Drury, Clifton Hildebrand, Harry Allcock, W. Mortimer Crocker.

4 Leaders in the World Metric Movement 353

Captain George P. Blow, C. E. Guillaume, A. E. Kennelly, General John J. Pershing.

Hon. Fred A. Britten, United States Congressman from Illinois 448

Hon. Edwin F. Ladd, United States Senator from North Dakota 449

CONTENTS

CHAPTER		PAGE
	Introduction	7
1.	World Metric Standardization: An Urgent Issue	15
2.	Keep the World War Won: Meter-Liter-Gram in World War and World Trade	18
3.	Metric Units in the World Today	32
4.	The Carnegie Committee Metric Report	38
5.	The World Trade Club Advocates Metric Standardization	45
6.	Organized Effort for World Metric Standardization	53
7.	The World Metric Standardization Council	118
8.	Metric Legislation Before Congress (United States of America)	148
9.	Who Urges Meter-Liter-Gram? Practical Men	180
	Pre-Eminent Americans	182
	Leaders of the World Disarmament Conference, 1921-22	186
	Manufacturers and Merchants	189
	Engineers, Architects, Accountants	213
	Scientists and Inventors	219
	Physicians, Surgeons and Pharmacists	222
	Agriculture and Forestry	224
	Army and Navy	231
	Bankers and Banking Institutions	234
	Insurance	236
	Lawyers and Jurists	237
	Clergy and Religious Congregations	240
	Educators	242
	Authors, Artists, Editors, Publicists	251
	Publications, Periodicals, Newspapers	254
	Officials and Legislative Bodies	262
	Typical World Opinion on Metric Standardization	269
10.	What Will Metric Standardization Cost?	273
	Metric Advance Easily Made	274
	How the Transition Can Be Made	294
	Metrics in Textile Industry	302
	Land Surveys Are Excepted	306
	Re-adjusting Scales and Weights	306
	Present Wide Use in the United States	307
	Strange Names Can Be Avoided	315
	Now Is The Time	317
	Present Jumble Causes Great Loss	318

11. The Metric Movement Thruout Britannia..... 353

12. A Monumental Metric Report..... 387
(Rendered by British Parliamentary Committee, 1862)

13. Select Articles on Metric Standardization..... 403
"The Metric System of Weights and Measures."
By Arthur E. Kennelly..... 404
"The Metric System as an Aid to After-War World Trade."
By William C. Redfield..... 408
"World Trade, World Unity and Metric Standardization."
By W. H. Hammer..... 412
"The Universal Language of Quantity—Meter-Liter-Gram."
By William E. Hague..... 417
"Industrial Reconstruction and the Metric System."
By Harry Allcock, M. I. E. E..... 420
"Metric Units and World Trade."
By Aubrey Drury..... 425

14. "Look It Up." World Metric Literature Clues..... 439
Reference Books..... 439
Books and Pamphlets..... 439
U. S. American Official Documents..... 452
British Parliamentary Reports, Accounts and Papers..... 467
Periodical Publications..... 469

15. A Discredited Document..... 496

16. Metric Progress in 1922..... 504

INDEX 514

INTRODUCTION

THIS book, "World Metric Standardization: An Urgent Issue," deals with an advance which is of immediate timely importance, and of vital interest to the United States of America and the British Commonwealths.

Herbert Hoover, United States Secretary of Commerce, speaking before the 1921 National Conference on Weights and Measures, declared: "**Standardization** is an outstanding necessity in the mind of every engineer desirous of the advance of industry and commerce. The whole conception of standardization has changed in recent years and has come to the first rank in importance.

"Today the question of standards has become a question embracing the very fundamentals of efficiency in our whole commercial and industrial fabric. While we have industrial efficiency developed, in its individual sense, to probably the highest average efficiency in the world, **we greatly lack** in what one might call our collective efficiency. There is no field where more constructive work can be accomplished in this direction of national efficiency of the whole gamut of production and distribution than in the field of standards."

This volume deals with the "master standards" of the world, upon which all the world is rapidly standardizing. These standards are the 3 metric units—meter, liter, gram. It is urged that the units of weights and measures of the United States of America, and of the British Commonwealths, be brought into accord with these invariable standards—the yard being advanced to the **meter**, the quart being advanced to the **liter**, and the pound to the **500-grams**. This is the true "standardization of standards," for when this advance is achieved in the United States of America and the British Commonwealths, all the world will be upon the uniform metric basis.

No One Objects to Liter and Gram

To the liter and the gram there have been practically no objectors. It has been agreed by all that the transition to these world units can be easily made. Objectors to the world yard, or **meter**, overlook the fact that it is urged for Commerce only—for Business. While it is known that the meter and its decimal divisions are well adapted to Industry, and may be used to advantage therein, the specific proposal is that the meter be used in **merchandising**, with

Industry continuing to use whatever units it desires in production. But the metric unit of length, the meter, is to be used to describe the size of things, after a transition period of 10 years. This is an advance to uniform terms of description, and does not alter the size of anything.

Those who obstruct metric standardization, it is authoritatively estimated, constitute less than 1% of all the voters. Under the proposed metric legislation, manufacturers are to do as they please in choice of units for production work. Thousands of progressive manufacturers urge the metric advance on that basis. Yet a small clique of manufacturers—who with their henchmen, are (as has been indicated) less than 1% of the voters—conspire to block the progress of the people. They cry out, "We don't want to be left behind; we don't want to do as we please; we want to *force* the 99% to stay behind with us." Such a dog-in-the-manger policy is foredoomed to failure. This vast country can not be run for the benefit of the objectors—the less than 1%.

Workers for Good of Humankind

Since the days of the good James Watt, hosts and armies of urgers have aided the metric advance. This they have done just purely for the good of their fellow humans. No urgers amongst all those hosts ever got, or ever hoped, expected or desired to get for themselves a gram of good—beyond the general good, attained by all humankind thru world uniformity of weights and measures. They have got naught for themselves, except (since 1871, when Germany adopted metric units) persecution—ruthless, relentless persecution.[1] Yet urgers of world metric standardization press on to victory, secure in the knowledge that theirs is patriotic and humanitarian endeavor, and that this great progress can be achieved for the benefit of all and to the injury of none.

Aid and Co-operation

The publication of this volume would not be possible without the aid and co-operation of workers in the cause of world metric standardization. It may be said with truth that thousands have contributed to its pages. This book represents the consolidation and integration of the most authoritative material upon world unification of standards. It makes available in collected form much which has hitherto appeared only in the form of articles or pamphlets, and in order to make these thoroly modern and reliable they have been revised to date. The printed sources quoted represent the researchings of a multitude of willing workers in the libraries of the world, carried on over a period of years.

[1] See pages 152-156: **German propaganda intrigue revealed.**

In this volume there is also a mass of valuable material printed for the first time. For this work, there have been available the 30,000 letters and papers on the metric movement gathered in the central files of the World Metric Standardization Council. Besides these, the material in the files of the American Metric Association, the British Decimal Association and other organizations, has been referred to.

This book is the result of a number of years of intensive study; and the actual preparation and writing have involved at least a year. It is trusted, therefore, that this book will be looked upon as an authoritative summary of the world advance to uniformity of weights and measures.

Organizations Urge

Acknowledgment is due to thousands who have made this book possible, thru their co-operation and aid. It is difficult to single out those to whom thanks are owing. First of all, gratitude must be expressed to the Executive Representatives and to the Advisory Committee of the World Metric Standardization Council, and to the thousands of members of this organization thruout the United States of America, the British Commonwealths, and all the world.

The officers and members of the American Metric Association and the British Decimal Association have been particularly helpful. Much aid has come from national organizations in the United States of America, such as the American Association for the Advancement of Science, the American Chemical Society, the National Wholesale Grocers' Association, the National Institute of Inventors, National Wholesale Druggists' Association, American Pharmaceutical Association, United Commercial Travelers of America, National Council of Mothers and Parent-Teachers Association, and many others. (Turn to page 60.)

The World Trade Club

Among organizations, special acknowledgment goes to that progressive organization in San Francisco, California, which is known locally as the Foreign Trade Club of San Francisco, and which for several years has participated in the world standardization movement under the broader title, **World Trade Club.** The letters and pamphlets of this organization have been made available for this publication, and they form the basis for several of the chapters, edited and brought up to date. The members of the Club have been active in forwarding the metric movement, and among the many may be mentioned William H. Hammer, William E. Hague, Ben C. Dailey, Nathaniel A. Davis, C. E. Hydes, H. W. Glensor, Newton Bishop Drury, John H. Gerrie, Gaston Giraud, James G.

Decatur, Clifton Hildebrand, John J. Arnold, E. W. Wilson. Mr. Hammer is President of the World Metric Standardization Council, and Mr. Hague is a member of the Advisory Committee. Mr. Dailey has rendered great service to the metric cause as a member of the Metric System Committee of the Chamber of Commerce of the United States of America, attending important sessions of that committee in New York City and Washington, D. C. Mr. Hammer was President of the Club in 1919-20, Mr. Dailey in 1920-21; Mr. Hydes in 1921; and Mr. Glensor in 1922. John H. Gerrie, well-known writer on world commercial affairs, aided the metric movement greatly by his business editorials on metric standardization; and Nathaniel A. Davis, in his magazine "World Trade" (official organ of the Club) has written effectively in advocacy of the advance. John J. Arnold, eminent banker and business man, presided at the World Metric Standardization Conference held in San Francisco, May, 1920; and E. W. Wilson, now President of the Philippines National Bank, Manila, co-operated most effectively. The several hundred members of the Club have formed a working unit which has proved truly powerful in forwarding the metric advance thruout the world.

Clifton Hildebrand

For aid in the preparation of this book, particular credit is due to **Clifton Hildebrand,** expert in economic research, and winner of the Joffre Medal on world affairs. He gathered much of the material utilized in Chapters 6, 9, 10, and other sections; he compiled the Index; and Chapter 14, "Look It Up," is based on his several years of research in the subject of world metric standardization. A considerable share of the effectiveness of this book is due to the careful work of Clifton Hildebrand.

W. Mortimer Crocker

Many important sections of this volume have been strengthened thru testimony secured by **W. Mortimer Crocker,** for 3 years Executive Representative in Washington, D. C., for the organizations urging the metric advance. His untimely death in the Knickerbocker Theater tragedy, Washington, D. C., 28 January, 1922, took from the metric movement one of its most loyal and effective workers. While he perished when still a young man (26), he rendered valuable service to his country and to the progress of world understanding. He did much to direct the attention of Congress and the National Administration to the importance of world metric standardization for the United States of America. The success of the metric movement today is in no small measure due to the endeavor of W. Mortimer Crocker.

British Collaborators

In preparation of this volume, all available sources have been utilized, all around the world. Particular acknowledgment is due to British collaborators who have maintained constant communication with the central headquarters of the World Metric Standardization Council. **Harry Allcock**, M. I. E. E., of Manchester, British Isles, is known as one of the foremost world authorities on metric-unit standardization, and his writings are copiously quoted in this book. G. E. M. Johnson, E. Merry and other officers and members of the British Decimal Association have aided greatly. The magazine of the Association, "The Decimal Educator," has been quoted extensively thruout this work.

Acknowledgment of Aid

Among those to whom special thanks are due for counsel and co-operation, aiding in making this book (and the metric movement) effective, are: Captain George P. Blow, President, Western Clock Company, La Salle, Illinois (Chairman, American Standardization Committee, International Chamber of Commerce); George Frederick Kunz, Vice-President of Tiffany's, New York, and President, American Metric Association; Howard Richards, Secretary, American Metric Association; Fred R. Drake, Easton, Pa., former President, National Wholesale Grocers' Association, and Member, Metric System Committee, Chamber of Commerce of the United States of America; Arthur P. Williams, of R. C. Williams & Company, wholesale grocers, New York City; Justin W. McEachren, Portland, Oregon, Editor "The Valve World" (Crane Company, Chicago, Illinois); Arthur E. Kennelly, Electrical Expert of Harvard University and Massachusetts Institute of Technology; Charles L. Parsons, Secretary, American Chemical Society; William Gibbs McAdoo, former United States Secretary of the Treasury and Director of Railroads; Melvil Dewey, Lake Placid Club, New York; E. C. Bingham, Lafayette College, Easton, Pa.; Clancey M. Lewis, Executive Secretary, Washington State Manufacturers Association, Seattle, Washington; Walter Scott Perry, Pratt Institute, Brooklyn, New York; Herbert Scott Blake, Fifth Avenue, New York City; Charles W. Eliot, President Emeritus, Harvard University; Luther Burbank, world's greatest grower, Santa Rosa, California; L. S. Rowe, Director-General, Pan-American Union; Constantine E. McGuire, United States Section, Inter-American High Commission; Elwood Haynes, President, Haynes Automobile Company; Samuel Vauclain, President, Baldwin Locomotive Works; Theodore H. Miller, Works Manager, DeLaval Separator Company, Poughkeepsie, New York; Fred J. Miller, recent Presi-

dent, American Society of Mechanical Engineers; F. O. Wells, for 20 years President, Greenfield (Mass.) Tap and Die Corporation; William Jay Schieffelin, President, Schieffelin & Company, New York City; William C. Redfield, for 7 years United States Secretary of Commerce, and 2 times President, American Manufacturers' Export Association; H. T. Wade, metric author, and Editor, New International Encyclopedia; David A. Molitor, Consulting Engineer, Detroit; Joseph V. Collins, mathematician, State Normal School, Stevens Point, Wisconsin; Alexander Graham Bell, inventor of the Telephone; S. L. Hilton, President, American Pharmaceutical Association; Guy A. Henry, Secretary-Manager, American Association of Wholesale Opticians; Paul R. Fay and Thomas Howard, of the National Institute of Inventors; Fred C. Taylor, Secretary, Millinery Jobbers Association, Chicago, Illinois; R. C. Bailey, Manager, Department of Chapter Activities, American Association of Engineers, Chicago, Illinois; Albert Shiels, Columbia University, New York City; A. E. Pradillo, Secretary, Foreign Trade Bureau, New Orleans Association of Commerce; Samuel Gompers, President, American Federation of Labor; Canuto Vargas, Secretary, Pan-American Federation of Labor; A. F. Du Pont, Baltimore, Maryland; Robert E. Swain, Stanford University, Palo Alto, California; C. Lucas Alsberg, Stanford University; R. T. Crane, Jr., President, The Crane Company, Chicago, Illinois; Harvey W. Wiley, Washington, D. C.; Arthur B. Smith, and other officers of the Automatic Electric Company, Chicago, Illinois; Burgess Darrow, Goodyear Tire & Rubber Company, Akron, Ohio; H. V. Arny, Professor of Chemistry, Columbia University; Dorr E. Felt, President, Felt & Tarrant (manufacturers of the Comptometer), Chicago, Illinois; Lazard Kahn, Vice-President, Estate Stove Company, Hamilton, Ohio; Roger W. Babson, Wellesley Hills, Massachusetts; Leon Lorrain, Secretary, Chamber of Commerce, Montreal, Canada; Alexander H. McKay, Halifax, Nova Scotia, Canada; Miss Amy Norris, convener, Metric Committee, Association of Protestant Teachers of Quebec, Canada; Miss Bessie Locke, Secretary, American National Kindergarten Association; Thomas Corwin Mendenhall, former Director, U. S. Geodetic Survey; Raymond F. Bacon, Charles Scribner Eaton, Winfield S. Hall, Edward V. Huntington, Louis C. Karpinski, Joseph F. Merrill, William A. Noyes, Zalmon G. Simmons, and George B. Vashon (all on the Advisory Committee of the World Metric Standardization Council); C. E. Guillaume, Director, World Bureau of Weights and Measures, Paris, France; C. A. Adams, Cambridge, Massachusetts; Frederic L. Rob-

erts, representative of American Metric Association, Washington, D. C.; Hon. E. F. Ladd, United States Senator from North Dakota; Hon. Fred A. Britten, United States Representative from Illinois; many officials of the Department of Commerce and other members of the Administration; and thousands of others thruout the world.

National and international humanitarian organizations; Masonic associations; Catholic and Jewish associations; members of the Society of Friends (Quakers), eminent in world work; missionaries of all denominations; the International Red Cross; educational associations; and influential newspapers and publications everywhere—all these have accorded aid to the metric movement. The list might be carried on indefinitely. The reader is referred especially to the support recorded in Chapter 6, "Organized Effort For World Metric Standardization," and in Chapter 9, "Who Urges Meter-Liter-Gram?"

The work of issuing this volume has been greatly facilitated by the hearty co-operation of the printers, the Sunset Press (Abbott-Brady Printing Corporation), San Francisco. H. C. Tibbitts, of this concern, has accorded the work his personal supervision; and thanks are likewise due to Frank Abbott, Jr., J. H. Brady, W. G. Brown, and others in the company.

Use the Index

In reading and consulting this volume, the reader is advised to make adequate use of the INDEX, which has been made very complete in order to serve as an efficient guide to those who wish to look up this important topic of World Metric Standardization.

AUBREY DRURY,
Executive Secretary,
WORLD METRIC STANDARDIZATION COUNCIL

Shall It Be This?

Meter.....Liter.....Gram

(The 3 units of the decimal metric system, always uniform; known and used thruout the world.)

Or This?

The obsolete jumble of weights and measures with which the English-speaking peoples are still encumbered: yards, fathoms, rods, leagues, perches, links, feet, inches, chains, furlongs, miles, knots, hands, spans, 2 different quarters, quarterns, ounces, minims, drams, grains, scruples, pennyweights, 3 different hundredweights, 2 different tons and 1 tun, 10 different stones, 4 different pounds, 2 different gallons, 2 different quarts, 2 different pints, gills, barrels, many different bushels, many pecks, and so on. Dry measure, wet measure, wine measure, beer measure, avoirdupois, apothecary, troy weight, and so on to an infinity of absurdity.

WHICH SHALL IT BE?

Retaining this antique jumble of unrelated units, which most of the world scrapt long ago, means an annual loss of millions of dollars to the English-speaking peoples in education; in world trade and domestic trade; in lack of preparedness for world war; and in lessened national efficiency thruout.

Aid the United States of America and the British Commonwealths to adopt "the world language of quantity"—Meter-Liter-Gram.

CHAPTER 1

WORLD METRIC STANDARDIZATION: AN URGENT ISSUE

AT the organization meeting of the International Chamber of Commerce, in Paris, one of the American delegates—a great clock manufacturer, president of a $10,000,000 corporation—was strongly and successfully urging metric standardization of weights and measures for all the world. Another delegate approached him during the discussion and asked him his reasons for this advocacy.

The great manufacturer replied: "I am working for metric standardization because I firmly believe this is the most important issue before the world today."

Certainly it is looming larger and larger in world affairs. It is a question intimately affecting the interests of the United States of America, and the British Commonwealths, for they alone among civilized nations are lagging behind. But with them also, as this book will show, it is a question well on its way to solution—and it will not be settled until it is settled right. It ought to be settled right, NOW.

This, too, is the opinion of the International Chamber of Commerce, which has strongly recommended "that in the whole world an uniformity of weights and measures be used, in order to facilitate international commerce."

Never before has the urgent need for standardization of their weights and measures with those of the rest of the world so prominently confronted the people of the United States and the British Commonwealths. The World War bore in upon them their isolation in this essential matter. They were utterly unable at once fully to aid their allies because of lack of standardized units, which other nations possess. America and Britannia discovered with a shock that they are not even standardized one with another. Great loss of men and money resulted from that lack of initial co-ordination, even tho the English-speaking peoples recognized their fault and sought to repair it by adopting the metric units for use in military affairs.

It was thus that the World War brought to the fore the desperate need for metric standardization—made it more than ever a world question. Men and women who saw its immense utility and unifying power in that time of stress, determined that the benefits of metric

standardization should be conferred permanently upon these two peoples, otherwise so progressive, but in this essential matter of weights and measures so strangely and falsely conservative. Powerful organizations, commercial and industrial concerns, and thousands of individuals accordingly united in a movement of education to secure legislation which will place the United States of America and the British Commonwealths upon the metric basis after a transition period of 10 years.

Petitions by the thousands have poured in upon the Congress of the United States of America and upon the British Parliament.

Tremendous Popular Demand for Metrics

There are today more than 103,000 individual petitions on file with the Department of Commerce, Washington, D. C., urging the enactment of a Metric Standardization law. Many of these petitions are from organizations having hundreds and thousands of members, so that altogether several million voters are directly represented in this appeal to Congress. Innumerable other letters and petitions favoring metric standardization have been sent personally to United States Senators and Representatives, and the deluge still continues. Supporting this popular demand are powerful newspapers and magazines all over the country.

States in the American Union—Illinois, California, North Dakota and Tennessee—with an aggregate population of 14,000,000 in 1921 thru their State Legislatures officially memorialized Congress to adopt the metric system for the benefit of all the people—and other States are falling in line for the metric advance. Utah a few years ago petitioned Congress to establish the metric units as the national standards, and the 3 Yankee States of Maine, Connecticut and New Hampshire have long been on record as favoring gradual metric standardization.

Congress is heedful of the desires of the American people, thus unmistakably expressed. In the House of Representatives the Metric Standards Bill has been introduced by Hon. Fred A. Britten of Illinois; in the Senate it has been presented by Hon. E. F. Ladd of North Dakota. Thus the standardization act is put forward by able and aggressive champions, each carrying out the expressed desires of the people of his State, and each determined to see the measure thru to success.

In both the Senate and the House of Representatives the Britten-Ladd Bill is assured of powerful support, and eminent officials of the Cabinet likewise will lend it their aid. Hearings on the metric bill are already being held in committee, and a favorable decision is forecast when the issue shall be placed for consideration before "the committee of the whole."

Favorable comment is heard everywhere regarding the liberal provisions of the Britten-Ladd Bill, which set at naught the clamor which alarmists have for years raised against the metric advance. The Britten-Ladd Bill (H. R. 10; S. 2267) provides for exclusive use of metric units of weights and measures in all commercial transactions in the United States of America after a transition period of 10 years. The bill pertains to merchandising, insuring that all trade shall be on the simple, worldwide metric basis. Manufacturers continue to use whatever measures they desire within their factories; but after 10 years their products are to be described in metric terms.

Section 8, Paragraph 2, of the Britten-Ladd Bill expressly states: "That nothing in this Act shall be understood or construed as applying to the construction or use in the arts, manufacture, or industry of any specification or drawing, tool, machine, or other appliance or implement designed, constructed, or graduated in any desired system."

Realizing that under the wise provisions of the Britten-Ladd Bill metric standardization can readily be achieved, merchants and manufacturers thruout the United States are discussing the metric advance with ever-increasing interest. So important has the question become before the nation that the Chamber of Commerce of the United States, with 1400 member organizations, has appointed a special Committee on the Metric System, under the Chairmanship of Edmund D. Fisher, eminent banker of New York City. This Committee has studied and reported upon the proposed gradual transition to the world standard weights and measures. On the basis of the committee report a nationwide discussion and Referendum is recommended, to crystallize the opinion of American Business upon this vital progress.

It is important to note that the business and commercial interests of Britannia have already declared their opinion, and in a most decisive manner. The 9th Congress of the Chambers of Commerce of the British Empire, held in Toronto, 1920, adopted resolutions by overwhelming majority in favor of gradual adoption of the decimal metric weights and measures thruout all the British commonwealths and dependencies.

The steady and rapid trend toward metric standardization among the 2 English-speaking peoples is manifest. It is being wisely hastened because in the keen commercial competition thruout the world today—in "the war after the war"—these 2 peoples are being tremendously handicapped by obsolete and outworn tools of trade which most of the nations scrapped long ago.

World Metric Standardization is an urgent issue. In order to aid in the prompt decision of that issue, this book is printed.

CHAPTER 2

KEEP THE WORLD WAR WON: Meter-Liter-Gram in World War and World Trade

ONE of the great victories of the world war was the defeat of an outworn German jumble of weights and measures, and the adoption by the Americans and the British for military purposes—that is, for purposes of efficiency—of a simple and logical decimal system of weights and measures. Peace must have its victory as well as war. Now it is for us to apply the lesson learnt from the world war to the activities of peace—to education, trade and all the relations of life. We must adopt the metric units if we are to make the best of our opportunities and keep the world war won.

It is urged that the metric units be put definitely into exclusive use in the best, most business-like way for the benefit of all and the injury of none.

Our Weights and Measures Made in Germany—Forced Upon Us by Germans

Strange as it may seem the present coinage of the British Isles, as well as the weights and measures of the British Isles and of the United States of America, are German.

The British pounds, both sterling and avoirdupois, originated with the old German Hanseatic League,[1] which for hundreds of years controlled the trade of England. This Hanseatic League was for a long period the only world trade club; hence its influence on weights, measures, coin. Indeed the dominance of the Germans in England continued until a competent business manager ousted the Hanse League from England—and it was a woman who did this patriotic work: Elizabeth.

The Germans forced these old standards on the British, who in turn landed them on America. America and Britannia[2] were one until 1776.

Germany Herself Scrapt the Antique Units

What is most remarkable is that America and the British Commonwealths continue to use these old German tools after Germany herself has scrapt and forgotten them, and adopted the simplest decimal system of quantity expression ever known to humankind—the application of

[1] See "German Hanse League," by H. Zimmern; "Outline History of German Hanse League," by Cornelius Walford; "The Hidden Hand in English History," by Ian D. Colvin, author of "The Germans in England."

[2] The name *Britannia* is often used to signify all the peoples and territories within the jurisdiction of the central British Government.

the decimal to weights and measures, the invention of that truly great Briton, James Watt.

It would be comical if its issues were not so tragic that the British and Americans use the old German jumble, while Germany uses ours —the efficient decimal, automatic system, 1000 times more effective than that the Germans scrapt.

Germany adopted the metric system in 1871, and the secret of the much-vaunted efficiency of the German military forces was that by means of the metric units all elements in her educational, industrial, commercial and military structure were standardized, with all details fitting and working interchangeably together. Without this standardization, uniformity and simplicity, there could have been no such co-ordination and efficiency.

Confused Standards of the Allies

The Allies, on the contrary, had at first no such standardization and interchangeable uniformity. The metric standards of France, Italy, Russia, Rumania, Greece, Belgium, Montenegro, Portugal, Serbia, and the rest—23 fighting allies and 7 who had broken off diplomatic relations with Germany, including the nations of Central and South America; that is to say, some 30 of the allies—were not interchangeable with the British and American weights and measures. Even British and American measures were not interchangeable,[1] with the result that great and grave difficulties, long costly delays, interfered with their co-ordination and efficiency promptly to aid their allies.

The Kaiser Counted on this Confusion

We know that the German Kaiser counted upon this confusion for 2 years' delay in the war preparations of the allies. We know that he expected to crush France and gain world power before the allies, thus handicapped, were really ready to fight.

In fact, F. O. Wells, for 20 years President of the Greenfield (Mass.) Tap, Die, Machine Tool Co., the concern that manufactured so many things indispensable to the supply of war munitions, states (and hosts of other experts agree with him) that the German Kaiser would not have dared declare war if America and the British Commonwealths had been standardized on metrics when the Germans adopted the system exclusively in 1871. In that event they could

[1] U. S. American gallon is about 20% smaller than Canadian gallon, and the sale in Canada of anything by wine measure (U. S. American measure) is illegal; Canada uses British beer measure.

The fact that by the Weights and Measures Act the metric units are legal in Canada, as in all other parts of the world, while the old United States measures of capacity are not even legal in Canada is only another emphatic, impressive reason why the metric units should be put into worldwide use.

The diversity of weights and measures among English-speaking peoples works great injury and injustice. During the war a San Francisco concern received an Australian cable asking it to offer 1,000,000 gallons of oil for immediate shipment. Bargain was closed by cable, oil shipped—then came Australian cable saying, "Of course you sold us Australian gallons." Yanks shipped 200,900 gallons more oil without charge, making them 20% loss. They are working for meter-liter-gram *now*.

instantly have co-operated with one another and with all their allies, co-ordinating the supplies and munitions from every part of the world. President Wells insists that this lack of standardization and of co-ordination lengthened the war 2 years.[1]

The French Minister of War, Millerand, said that Kitchener's volunteers promptly arrived in France, splendid battalions, but *unarmed*—there was plenty of ammunition for them, but their guns were not standardized to use it.

Joseph P. Colter, who acted as Hoover's representative, and Dwight W. Morrow, member of J. P. Morgan Co., with a distinguished service record during the war, say in June, 1919, *Atlantic Monthly,* page 804: "Allies each had individual types of munitions . . . The lesson of co-operation was forced upon them, but not until the 3rd and 4th years did they finally admit that not only all their strength, but the joint use of all their strength, was essential."

War Needs Led Us to Metric Standards

The world war brought out this eloquent fact: Both Britannia and America were obliged to adopt the metric standards for war use. These standards were brought into use by the British War Department in 1914. U. S. War Department Order Number One, issued on 2 January, 1918, declared: "The metric system has been adopted for use in France for all firing data for artillery and machine guns, in the preparation of operation orders and in map construction."[2] Virtually the same order went into effect in training camps thruout the United States. This made the use of the metric system in warfare unanimous, and may truly be termed one of the great victories of the war.

Why Had We Not Adopted It Before?

What is this metric system that proved such an all-powerful factor in the winning of the world war? Why is it that enlightened peoples such as the British and Americans should have been apparently blind to the necessity of this system since 1783, while the rest of the civilized world has recognized and adopted it?

For the world to adopt anything for worldwide, everybody's everyday use requires that it be simple—extremely simple.

All the world has adopted the alphabet of letters for written expression, each people in its own language.

All the world has adopted the Arabic numerals, 1234567890, for its mathematical computation.

---

[1] For testimony as to the vast amount of valuable time lost thru lack of metric units, see "America's Munitions," pages 26, 62, 65, 69, 156, 481, 497, 504. This remarkable official report is by Benedict Crowell, Assistant Secretary of War, Director of Munitions.

[2] Ordnance such as the 75, 155 and 240 millimeter guns have been adopted by the United States Army and are successfully made in America. (See Benedict Crowell's report, "America's Munitions.") Metrics are exclusively used by U. S. American Surgeon General's Department.

All the civilized world has adopted metric units to express weights and measures, with the exception of the United States of America and the British Commonwealths.

Simplicity of the Metric System

The metric system is simply one worldwide uniform method of expressing weights and measures in units, decimally divided. It is like the American monetary system. Whereas in American money the *dollar* is the unit, in the metric system there are 3 other principal units: *meter* for length; *liter* for bulk; *gram* for weight. These are standard all over the world. And each of these units, like the dollar, is multiplied or divided decimally.

Dollar, meter, liter, gram are simply names to indicate whether the computation refers to money, length, bulk or weight. We may use the same terms to express meters, liters and grams as we do to express dollars.

1.111 is exprest as one dollar, one 10 cent, one cent, one mill.

1.111 is exprest as one meter, one *deci*-meter, one *cent*-imeter, one *mill*-imeter.

1.111 is exprest as one liter, one *deci*-liter, one *cent*-iliter, one *mill*-iliter.

1.111 is exprest as one gram, one *deci*-gram, one *cent*-igram, one *mill*-igram.

Greek Prefixes Need not be Used

There are terms for multiples of the unit used by others—we need not use them. These are *deka* for 10; *hecto* for 100; *kilo* for 1000. In practical work, we may speak of 10-100-1000-10,000 meters, liters or grams in the same way that we speak of 10-100-1000-10,000 dollars.

In order to give a definite idea of the value of each of the metric units: The meter is 10% greater than the yard; 500 grams is 10% greater than the pound avoirdupois; the liter is 5% more than the U. S. liquid quart and 13% less than the British liquid quart.

Origin of the Metric System

The question arises, how has such a unified system originated? How has the world so skillfully worked from the complex to the simple? Director S. W. Stratton of U. S. American Government Bureau of Standards, tells in an admirable article.[1]

The great British inventor, James Watt, who made possible to humankind the steam engine, steam pump, steamboat, steam railway and steam turbine, and after whom the unit of electric power is named, is the man who thought out and suggested the metric system as the way out of the intolerable confusion caused by the lack of a world language for the expression of quantity.

[1] In "Encyclopedia Americana," published by the *Scientific American*. Read this article.

United States of America First to Adopt Metric Money

The first recognition of this system came from America. In his first message to Congress, George Washington said: "A uniformity of weights and measures is among the important objects submitted to you by the Constitution and if it can be derived from a standard at once invariable and universal, it must be no less honorable to the public council than conducive to the public convenience."

Had the United States of America heeded Thomas Jefferson, we should have adopted the system in 1786, for it was then that he most strongly urged its adoption. But while the United States was that year pioneer in adopting the metric decimal dollar, her legislators failed unfortunately to adopt the other 3 principal metric units, meter-liter-gram. Thinking men have repented this lack of legislative foresight and forethought, and in 1866 Congress legalized the metric system, but missed the opportunity for complete simplification by not making it the exclusive standard. Since 1866, all congressional committees on weights and measures which have reported on the subject have unanimously urged legislation for the exclusive adoption of meter-liter-gram.

All Civilized Nations Except the British and Americans Have Adopted Metrics

In 1799, France thru the wisdom of Talleyrand, adopted the metric system. From that time nation after nation has adopted it, until today 40 important nations have by contract adopted it exclusively and more than 200 countries are using its units.[1] The British Commonwealths and the United States of America alone of all the civilized nations failed to use it exclusively. The British Isles have lagged so far behind that they even retain the old undecimalized pounds, shillings, pence and farthings of an antique German coinage.

The British House of Commons voted to adopt the metric system exclusively, but the House of Lords rejected it. In 1904, the House of Lords passed just such a bill, but, thru political engineering it failed in the House of Commons by a close vote—150 to 126. Thus were defeated the vital interests of the British people.[2]

Metric System in Worldwide Use in all Sciences

The time has come to take advantage of the teachings of the world war. Why should 2 forward-looking peoples continue to be bound in slavery to an obsolete German jumble? Science has long ago scrapt it. The metric system has been adopted in the sciences of war and peace

[1] There are 40 nations which by official signature have formally contracted to use exclusively the metric system and pay annually their share of expense of maintenance of the World Bureau of Weights and Measures, Paris. There are more than 200 countries which now practically use metric units, even tho they do not always use all the metric units, or the whole system, or all the names. For a list of the countries using the metric units, see the Map pages at the front of this book.

[2] Lady Astor recently said in the British Parliament, "Many British legislators are still in Noah's Ark!" See, however, Chapter 11, "Metric Movement Thruout Britannia."

—in medicine, pharmacy, optometry, photography, physics, chemistry, seismology, astronomy, electricity, microscopy, aviation and so on. The next step is to make the use of the metric units worldwide in business, education, life. This will be accomplished by the adoption of the metric system for exclusive use within the jurisdiction of Britannia and the United States of America.

Why has this adoption not been heretofore accomplished?

One of the reasons may be a confusion caused by Latin and Greek prefixes. Sometimes the popularity of an invaluable necessity is deferred by its name. The metric system may be the victim of terms—not the name "metric," perhaps, altho even that may seem formidable. But the Latin and Greek prefixes tend to confuse the minds of the many and obscure the Watt simplicity of the system.

This, however, can be disposed of as inconsequential. As has already been shown, all the metric units may be multiplied and divided just like the dollar. There is no need for Greek prefixes—and the Latin prefixes are already familiar, being those used in American metric money.

Now We Know the Value of World-Oneness

Another thing that until recently held back the worldwide adoption of the metric system was ignorance of the value of uniformity, world-oneness. Until 1914 Germany, Austria-Hungary, Bulgaria, Turkey had not succeeded in convincing Britannia and America of the vital necessity of being standardized; always ready; equipt with the best for world war and world trade—in constant common council. Now they are convinced. They perceive that oneness, uniformity in world trade as in world war is vital to unwasteful success. There is a common axiom that one poor general is better than 30 better ones. And one excellent general is infinitely more efficient!

Besides ignorance of the value of world uniformity, there have been other influences, too, that have retarded progress. The first is *inertia;* another is *blindness* to the educational and trade benefits attainable by uniformity; another is *fear* of the cost of progressing to metric units. These objections may be answered in detail.

Conservative Habits of Mind

First as to the unreasonable, unpractical conservatives. They have delayed many measures beneficial to humankind. In the matter of weights and measures we have been bound by habit and custom. We think habitually in terms of feet, inches, quarts, gallons, and all of the innumerable other unrelated units—yards, hands, spans, fathoms, rods, leagues, perches, links, chains, furlongs, miles, knots, 2 different quarters, quarterns, ounces, minims, drams, grains, scruples, dwts., 3 different cwts., 2 different tons and 1 tun, 10 different stones, 4 different pounds, 4 different ounces, 2 different gallons, 2 different

quarts, 2 different pints, gills, barrels, many different bushels, many pecks, and so on. Also we try to think with different units for different objects. Dry measure, wet measure, wine measure, beer measure, avoirdupois, apothecary, troy weight and so on, so on.[1]

We are Victims of Mental Slavery

This is all highly complicated; yet some seem afraid to scrap it, altho we could learn the essentials of the metric system in 10 minutes. We are the victims of an ugly mental slavery, and as a consequence the British and Americans are still essaying to play their part in the world with a German jumble of measuring units which Germany herself scrapt in 1871, and put in her museums beside bows and arrows, stone axes, stone adzes and other stone age implements.

Now as to other objectionists: There are the **blind** who cannot see the benefits of meter-liter-gram. They cannot see the great advantages in education and worldwide uniformity.

The Educational Advantages

The average child of 10, who knows the metric decimal dollar and its sub-divisions, can learn in 10 minutes as much of the metric system as 90% of all the people ever have occasion to use. Contrast this with the present complicated jumble, which, Gladstone said, no one in all the world could ever explain.

Clyde Wolfe, (Ph. D.), Master Mathematician, University of California, writes: "A conservative estimate is that the exclusive use of meter-liter-gram will shorten the time of teaching arithmetic to the average child by 2 years."

"The Educational Review," speaking with authority, declares that investigation shows that the children of Germany, France, Italy are 2 full years ahead of children of the same age in Britannia and America. Think about this!

Doctor Joseph V. Collins, writing in the "Scientific Monthly," states and proves that the people of the United States of America lose $314,000,000 yearly in education by continuing to use weights and measures scrapt by the Germans in 1871.

The British Prime Minister recently appointed a committee to inquire into the position of natural science in the educational system of the British Isles and it reported (Cd. 9011): "The present chaos of British weights, measures, coins, causes great waste of time and confusion of thought which are strong educational reasons for the adoption of the metric system." This applies with equal truth to North America, Australia, Tasmania, New Zealand, United South Africa and other Britannic countries.

---

[1] "Divers weights and divers measures both of them alike are abomination to the Lord." —PROVERBS, 20:10.

"The adoption of the metric system by the United States of America would greatly reduce labor in trades because of the thoro decimal quality of the system and facilitate teaching of mathematics and applied sciences in schools." This is a telegram received by the World Trade Club, from Charles W. Eliot, President Emeritus of Harvard University, and "America's most eminent citizen."

No Obstacles in the Way

There are timorous ones who cry out against the supposed difficulty of making the advance to metric units and against its cost. These are not real obstacles to worldwide adoption of meter-liter-gram.

Do they anticipate confusion in making the transition? This fear is unfounded. Day after day, manufacturing concerns in the United States and the British Isles are actually making the advance to metric standards without difficulty, without confusion, without delay, without undue cost. The only possible confusion is that which exists as long as we are compelled to transfer, translate, transcribe the obsolete units into and out of meter-liter-gram.

Arthur E. Kennelly, electrical expert of Massachusetts Institute of Technology, and Harvard University, writes: "We have the history of almost all nations to guide us in estimating the small degree of difficulty which may be expected in effecting the progress to metric units. Any trouble will be intellectual, not material." And there will be no real mental difficulty. The problem is only one of simple mental arithmetic. Once let the 3 units be clearly understood, once let the decimal nature of the system be made clear, and the rest is easily done.

Panama, Philippines, Porto Rico, Cuba—in a sense, virtually parts of the United States of America—have long used meter-liter-gram, and other Americans going to and working in these parts find they gain proficiency in the use of the metric units in about 2 weeks without effort, and wonder why the rest of the United States continues to muddle along with the old German jumble.

Cost of Progress will be Microscopic

It may be feared by some that the expense of progress might prove prohibitive. It did *not* prove so to the more than 200 countries of the world which now use metric units. Cannot America and Britannia do what the Germans did in 1871—put meter-liter-gram into exclusive use? Scrap the obsolete!

The item of cost[1] is dealt with authoritatively in a report prepared in 1915 by Director S. W. Stratton of the United States Government Bureau of Standards, for the International High Commission on the Uniformity of Pan-American Laws.

[1] A full discussion of the item of cost will be found in Chapter 10 of this book, "What Will Metric Standardization Cost?"

This report brings out many significant facts. It urges an extension of the use of the metric system in production, manufacture, and trade. It shows that very many large manufacturers, merchandisers, enterprisers and producers are already using the metric system for both domestic and world trade.

Typical examples are given by Director Stratton of large, successful manufacturers who are already using the metric system, in some cases for both domestic and world trade. The list[1], which he truly says might be extended almost indefinitely, includes:

American Locomotive Co., Baldwin Locomotive Works, Brown & Sharpe (measuring tools and gages), Pratt & Whitney (metric gages and standards), Waltham Watch Co., The Standard Tool Co., Morse Twist Drill Co., Bausch and Lomb Optical Co., Eastman Kodak Co., Lufkin Rule Co. (measuring tapes and rules), International Exporting and Importing Corp'n, Keuffel & Esser Co. (draughting instruments), Powers-Weightman-Rosengarten (drugs and chemicals), Library Bureau, DeLaval Cream Separator Co., L. S. Starrett Co. (fine mechanical tools), Greenfield (Mass.) Tap, Die, Machine Tool Co.

It would be truly surprising to many to learn the extent to which the metric system is already used by manufacturers of Britannia and the United States of America.

Transition Often Costs Nothing

Director Stratton takes up specifically the question of the cost of adopting metric standards. He quotes many manufacturers, notably large locomotive works, which handled an order for 100 locomotives, all of which were in metric measure, and also quotes the head of a large firm of exporters of canned goods. Both declared that the progress to the metric system in their particular lines would not cost a cent.

In practically every line of manufacture the difficulty and expense of adopting the metric units would be inconsiderable. Experience of American firms with world trade has verified this. In industries such as the manufacturing of flour, paints, chemicals, optical goods and drugs, the problem is solved easily by simply changing the size of the container in which the goods are shipped.[2] As a matter of fact, flour packed for Latin American export trade is now measured in 500 or 1000 grams, instead of pounds. A prominent cement manufacturing company is credited by Director Stratton with this statement: "All our business with South America is done on a basis of barrels of 180,000; 150,000; 120,000 grams respectively. In other

[1] Not all of these firms have petitioned Congress for exclusive use of metric units thruout the United States of America; but all of them actually employ metric units to a considerable extent. Hundreds of industrial concerns urging exclusive metric standardization for merchandising, as provided in the Britten-Ladd Bill, are listed in this volume.

[2] Often, indeed, it is necessary only to state the size of containers in metric units, without any alteration in the containers themselves.

words, in export business with South America the 500 grams is the measure—10% greater than the pound. All manufacturers exporting Portland cement to South America are using the metric system, just as we are."

In tools, machinery, implements, where difficulty and expense have been anticipated by some, Director Stratton is certain that the benefits to be obtained would far offset them. He points out that there is no scale, gage or tool maker today who is making scales for weighing or measuring, or tools working to size, such as drills, reamers, and so on, who is not already making such products to the metric sizes. They are led to it by the demands of world trade.

Meter-liter-gram to Advance Invention

Moreover, as Director Stratton shows, most of the great advances in the way of scientific invention are set forth in newspapers and technical literature in terms of the metric system, and in order to take full advantage of these ideas it is necessary for our manufacturers and inventors to utilize and be familiar with the metric system. There should be no hesitancy in scrapping obsolete, antiquated processes which hinder advancement and efficiency. He further points out that the whole process of making electric lamps has been changed 3 times in a generation; that one great railroad has been rebuilt in the lifetime of men now living, and that the business of generating and distributing electricity is changing so rapidly that it is difficult to keep pace with it. How much simpler would be the progress to meter-liter-gram in weights and measures. Instead of confusion, adoption of a world system of measures will bring a spirit of enterprise, mark a new era of inventing, manufacturing and merchandising; and sweep away conditions that militate against world peace.

How It was Done in Germany

All this is borne out by the experience of those countries that have adopted the metric system. In Germany the transition was made in the cities within a few weeks; in the country within a few months. Manufacturers went on just as they were, using the tools, machines, implements, drawings, designs they had used, till all these were worn out. The transition was accomplished similarly in other countries. As Director Stratton well says, there is no need of abandoning implements, looms or machines. It is simply a question of adjusting weights, re-marking and re-calibrating, and expressing in terms of metric units.

Metric System Pays for Itself

Those manufacturers who have adopted meter-liter-gram have found the saving to be so great that the cost was quickly made up. Kynoch, the Krupp of the British Isles, adopted the metric system and its Presi-

dent, Chamberlain, declared that it paid for itself in one year at a cost of only 1% of a year's dividend.

Think of the vast saving in time, and therefore in money, that would be effected by this improvement in our system of weights and measures. All computations would be made decimally. Thus it would be possible to utilize computing machines, which now we use only in money computations. The modern calculator adds, multiplies, divides, subtracts, with the speed of light and with satanic accuracy. Think what a boon it will be when we can use such machines, not only in calculating with money, but also in calculating meters, liters, grams.

The Greenfield (Mass.) Tap, Die, Machine Tool concern adopted metrics in 1914 and saved annually $50,000.00 for itself. F. O. Wells, then President of this concern, stated that as the transition was made gradually, it cost nothing. Many other manufacturers of America and the British Isles who either make exclusive use of the metric units or use both standards have found that the fancy about the supposed difficulty and expense of making the transition is indeed a mirage.

"Not one of the accurately standardized gages at present in use in British and American engineering workshops will need to be changed when the metric system is adopted," is the declaration made by the great inventor, Lord Kelvin.

License the Laggards

The Metric Bill now before the United States Congress explicitly provides that existing equipment and machinery may continue to be used in factories. What is proposed is that the products of factories, after a transition period of 10 years, shall be merchandised on the world metric basis.

However, if any manufacturing concerns maintain that to make the advance to metrics would involve financial loss, we willingly consent that our Government grant licenses to those who to proper authorities prove that exclusive use of meter-liter-gram really would injure them—license them to use the old German jumble till they are dead—or awake! The model, the Swiss republic, thus licensed watchmakers. The watchmakers watched out and found that they were letting valuable advantages go by, so they voluntarily adopted meter-liter-gram. You could not get them now to use the old German jumble. Swiss motors, engines, machines, run and work like *Patek Filip* Swiss watches.

Vast Gain in World Trade

But over and above considerations of difficulty and cost in achieving this metric progress, there is still an argument which disposes of all remaining blind obstructionists. It is the fact that these objections fade into insignificance in the face of the overwhelming commercial benefits

that will come to the United States of America and the British Commonwealths immediately upon the adoption of the metric units exclusively.

The great reason for exclusive use of meter-liter-gram is that **standardization** is essential to efficient world trade.

The World Has Become Smaller —Now a Unit

The world war has proved the interdependence of the modern world. The rapid development of the airplane and the non-inflammable helium Zep, the increasing facilities for transportation, the increasing facility of communication, the development of radio-telegraphy and radio-telephony—these and all other advances are constantly bringing the world together and making more profitable the interchange of raw materials, food and manufactured articles. With this interchange comes increased interchange of ideas and of scientific service. This means that there must be improved facilities—up-to-date tools—for all such interchange, and while we may be far from the development of world speech, experience has shown that we have at least available and ready for our use a world language of quantity. (See *all* keyboards, *all* typewriters in *all* languages: 1234567890.) In the field of knowledge, the thinkers have already solved the problem by the universal adoption of the metric units of measurement. In production, manufacture and world trade we must reach a similar solution. We must buy and sell, make and measure in terms that are simple, interchangeable and intelligible to all. **In a word, we must make worldwide** the use of meter-liter-gram. The allies demand standardization—oneness, uniformity—to at least equal the standardization of the Germans.

"From the moment that a wireless telegraph key is closed at one point on the earth's surface to the moment when the outgoing invisible electric wave arrives at the opposite side of the globe, is a little more than a 15th of a second. This fact is daily bearing in its effect upon us all, whether we like it or not. Under these circumstances, how ridiculous it seems to attempt to keep more than one system of weights and measures going in the world. *Only the Metric System can possibly survive on a 15th-of-a-second-globe.*" These are the eloquent words of Arthur E. Kennelly, collaborator with Thomas A. Edison in many electrical developments.

Should not meter-liter-gram be put into use as were railway standard time, the world postal union, the Marconi worldwide code, the worldwide telegraph union, world airplane and Zep road rules for air navigation? As a war or peace measure, it will be a comparatively small undertaking. Can we afford to be unprepared for

world trade, and always possible war—even inciting war by this unpreparedness?

Consider the business facilities implied by uniform standardization *everywhere* in use; consider the simplification of sizes of *every commodity*. In this airplane age, where the pilot may cover 1000 miles in a few hours, uniformity of standards is indispensable. Consider the ease, economy and accuracy of registering, calculating, computing, recording, tabulating, invoicing, quoting and cataloging to the world that reads American-British publications, and of educating the 570 millions of Britannia and the United States of America. The people of every land will use the same units in peace, or will be ready with them to aid all allies instantly in war. It will add a year or more to the life of each of these 570 million humans of Britannia and America, and the other 1000 million humans will benefit enormously.

World Trade Authorities Agree

John H. Gerrie, a Business Editor and authority, and a world-traveled trade expert, says: "The American is entering upon world trade with the wrong kind of tools. At the outset of its expanded merchandising career, the United States of America is sorely handicapped in the fierce competition of the advanced trading nations of the earth.

"Why not try the exclusive use of the metric units in the United States of America? This is recommended in a resolution adopted by the United States section of the International High Commission, of which William G. McAdoo is chairman. This would seem the logical time for their adoption into worldwide use. They are in use in every civilized nation, excepting only the United States of America and Britannia. Their exclusive use would greatly facilitate world commercial relations. The President and the Premier can promulgate the metric system in 10 minutes for America and Britannia to the benefit of all humankind. Try it; then go back to chaos if you wish."

What Editor Gerrie says of the United States of America is equally true of Britannia. The French merchant, the German, the Dutch, will do business in the world market with weights and measures commonly understood and used by the world. The English-speaking grower, producer, enterpriser, manufacturer, merchant will attempt to trade with weights and measures now obsolete among all except 2 peoples and intensely difficult of comprehension.

Thus shackled, we are hopelessly handicapped in striving for the profitable commerce of Eurasia, Africa, South and Central America. We are helplessly handicapped all the world over.

Elsewhere in this volume there are cited hundreds of typical statements by world trade experts who advocate the scrapping of the

obsolete units. Yet here we can do little more than indicate the wide extent of the demand for the world metric weights and measures. A list of urgers' names, the best in the world, would fill books.

"Get the Thing Done"

The wealth of testimony is nothing new. Enlightened humans everywhere have realized for generations that the metric system is the only logical system to be used all the world over. The difficulty is to overcome inertia. The problem is to secure action—to get the thing done.

If lack of meter-liter-gram lengthened the war (and it did); if lack of meter-liter-gram lengthens the period of education (and it does), surely these 2 reasons alone would suffice to justify the advance to metric units. But, as has been shown, there are scores of other reasons.

As we enter the era of world peace, let us prepare to reap and garner the harvest of trade that is attainable. At the same time, let us equip ourselves against possible aggression by making ours the most powerful military asset of all, namely—absolute uniformity of standard in war material. In world trade, in world war, in world education, we *need* meter-liter-gram. It is a vital, desperate need.

There is no time like the present. It is the hour of destiny. We must take up the exclusive use of metric units *now*.

CHAPTER 3

METRIC UNITS IN THE WORLD TODAY

ONE of the most potent urges to swift acceptance of the metric units by the lagging English-speaking nations has been the news of the final and complete adoption of the metric units by the Empire of Japan, 1921. The alert Japanese have acted with characteristic energy and decision. To them metrics are already familiar, for these units have been employed exclusively by Japan for militaristic purposes since 1871, the year Germany adopted them. The facts are significant. Keen students of world affairs have seen in this complete adoption of the metric system by Japan the securing of a powerful weapon, which is sure to be an important trade factor, and which might in the future be used for militaristic purposes as well, just as Germany used metric standardization greatly to its own advantage in the World War of 1914-18. One watchful observer points out that "the 3 most troublesome nations," as he calls them—Germany, Russia and Japan—are now upon the common basis of the metric standards, and he declares that this fact will have its bearing upon future world affairs. Certainly it is a situation meriting the closest attention of the United States of America.

The fact appears, in the case of Japan and other nations likewise, that metric standardization is modern preparedness for both world warfare and world commerce. Considering how largely mass production and supply enter into modern war, the importance of permanent industrial co-ordination is self-evident. World war and world trade are, in truth, only different phases of the competition between nations. But in war the test of efficiency is fiercer—ancient equipment goes down inevitably before the modern—faulty co-ordination shows forth as a glaring weakness, for it means the needless slaying of thousands of men—even hundreds of thousands—and the maiming of twice as many. Neglect is paid for in blood and treasure. In the struggle for world trade, however, the weaknesses of national organization are often perceived by those most concerned, but not always by the people as a unit. Yet war's bitter teachings are not allowed to pass unheeded by the wise nations of the earth, if they are to survive.

All this is admirably summarized in an article on "Standardization," by Waldon Fawcett, in the October (1921) issue of "Pacific Ports," a leading world trade magazine. He says: "The trend to standardize in industry is really a worldwide manifestation. Unmistakably it is an outgrowth of the war, and a logical outgrowth. As a matter of fact, this latter-day ideal of standardization was born of wartime necessity. It was dictated by 2 considerations: (1) the necessity of conserving and concentrating manufacturing and productive resources in the countries organized for war; (2) the requirement for *interchangeability* of military supplies and equipment that were to be used by allied forces operating simultaneously on a far-flung battle line. It is worth while noting that the lessons that the war brought of the need and advantage of (world) standardization were the same, tho on a larger scale, that had been set before a limited share of the world's population for, lo, these many years."

New Dependence on World Trade

Largely due to the effects of the World War, the position of the United States in reference to exterior commerce has undergone a fundamental change. More than ever, we have become dependent for national prosperity upon world trade. We cannot get along without it. During the course of the war we became possessed of world markets, and to meet their needs expanded the output facilities of our factories and vastly increased the production of our farmlands. Now, unless we are willing to face retrenchment and take tremendous loss on every hand, we must sell abroad. In the face of the keenest trade competition the world has ever known, we are bound to utilize all the efficient time-saving, labor-saving methods developed by moderns. We cannot afford to try to "muddle along" with Stone Age tools of trade which most progressive peoples were wise enough to scrap long ago. The race is to the swift, not to the laggard.

How pitiful is it then to hear obstructionists prate about the "cost" of making the gradual transition to metric units, when blind retention of the present clutter of weights and measures is contributing largely to the loss of millions of dollars in profitable wage-paying trade.

Upon this point, what better authority could be cited than a governmental Secretary of Commerce of the United States? The eminent men holding this position have been unanimous in urging world standardization for America. William C. Redfield, for 7 years United States Secretary of Commerce, and 2 times President of the American Manufacturers Export Association, signifi-

cantly states: "If we want to throw the business of the United States into the hands of a Germany of the future, into the hands of the French steel and iron manufacturers; if we wish to develop the business of Italy, Holland, Denmark and Spain we can do it perfectly well, and build up the business of those countries at the expense of our own, by confining ourselves to feet and inches, which do not work well in other countries and which the world will not have. We may just as well get ready to adjust ourselves to the great world by making this advance to the metric standards."

Trade Taken by Germany

Germany is not now engaged in military aggression—but because of that very fact (as Senator Borah has well shown) its attention is concentrated the more strongly upon dominance in world trade. Equipped with the "world language of quantity"—meter-liter-gram—Germany is besting the English-speaking peoples in the choicest commercial fields, partly because they refuse to scrap their obsolete, incomprehensible quantity units. Surely, and not slowly, this aggressive trading nation is wresting from us the rich markets of Latin America once thrown to us by fortune of war.

Dr. W. E. Aughinbaugh, World Trade Editor of the New York "Commercial", in an editorial in that journal on 6 August, 1921, declared: "An order for oil-cloth totaling $100,000, from the Argentine, has just been placed with a German firm because the American manufacturers in this line refused to make the goods according to the metric system. Oil-cloth made in feet and inches means a waste and inconvenience to the Latin-American, a fact which our producers fail to recognize, and which *costs us millions of dollars worth of business annually.*"

John Lind, at one time President Wilson's special representative in Mexico, writes: "We must get into line with the commercial world in the matter of weights and measures. I asked an intelligent German merchant in Vera Cruz one day to explain to me how it had come about that Germany had absorbed so much of the trade that at one time went to England. He reached into a drawer, pulled out an invoice from England and said, 'Do you see those denominations of yards, feet and inches, gallons and pints; pounds, 2 kinds of ounces, grains and penny-weights, the whole summed up in pounds, shillings and pence? Well', he continued, 'a Mexican, even if he can read a little English, needs an interpreter and an accountant to put this into the language of civilization. That is why we get the business'."

If space allowed, the instances cited by these eminent authorities could be supplemented by 1000 similar examples. Lost orders are difficult to trace—of many other thousands thus "passed up" we

never learn. Nor can we know the full amount of wastage arising from the numberless errors and the loss of time arising out of the translations and transpositions into and out of the metric units, now necessary in exterior commerce because we are not yet on the world metric basis. But we do know that all this avoidable loss to the United States in world trade must indeed run into tremendous figures.

This loss of national income, this falling off in our world trade thru lack of true efficiency, is particularly deplorable in times of slack business. It means that factories that ought to be selling abroad are closing down and turning away their workers. The millions of dollars we are thus losing annually would mean prosperity to hundreds of thousands of Americans.

The fact is, Germany is getting the business, Japan is getting the business. We are getting left.

Shipping Board Heads Urge Metric Units

What wonder that the Chairman of the United States Shipping Board, seeing the nation's ships by the hundreds laid up idle in the mudflats of our harbors, and wishing to do his utmost to promote our overseas commerce, has come out strongly for prompt adoption of world standards by the United States. Hon. A. D. Lasker, on 7 July, 1921, declared: "The metric system is in my opinion necessary, and must be adopted by the United States within the future in order that our business operations may be conducted in an intelligent way, and I feel that the sooner its adoption is brought about in this country the better it will be for the country."

Since the World War, conditions have indeed changed. There is now another vastly important financial reason why Americans must place prime importance upon world trade and the methods for its upbuilding. In former years we had only a negligible merchant marine. Today we have a great carrier fleet that has cost American taxpayers 3 billion dollars; and in order to save our people from impending monetary loss, we are obliged to find permanent employment for that fleet. In the opinion of Chairman Lasker, one of the best ways to hold the business we have and to secure large and profitable cargoes is adoption of the world standards forthwith. Such also was the publicly announced opinion of his predecessors as Chairman—Admiral W. S. Benson and John Barton Payne. Thus metric standardization has been strongly urged by 3 leaders of the greatest corporation in the world today—the United States Shipping Board.

Metric System Is World System

World traders as a unit want the United States to go onto the metric basis, for upon that basis are conducted the business transactions of a majority of the world's people; and this will be increasingly so in the future.

Already in this volume we have surveyed the worldwide advance to metric standardization. All civilized peoples have accepted the world units as their standards with the exception of the Americans and the British. While these 2 peoples lag behind, 40 important nations have progressed to the metric system. Including colonial dependencies, more than 200 countries are now merchandising on the basis of meter-liter-gram. The population of the countries employing these simple metric units outnumbers those using the diverse "British" units at least 4 to 1, and the ratio is being steadily increased.

The metric system is now accepted as the standard by all of continental Europe—more than 400,000,000 people. In Africa, it is used in the vast colonies of France, Belgium, Portugal, Holland, Italy and Spain. All Latin America, from the Rio Grande to Cape Horn, has unified for trade on the metric standards. Official surveys by consular officers of both the United States and Great Britain are conclusive on this point: the metric system is predominant in South America, Central America and the West Indies. The Director-General of the Pan-American Union, Hon. L. S. Rowe, is an advocate of prompt adoption by the United States of these world-recognized standards. His predecessor, Hon. John Barrett, is likewise an ardent worker for exclusive use of metric units. These experts know the facts. They realize that Pan-America in the future is destined to transact all its business on the unified basis of meter-liter-gram.

Metric Units Dominate Trade of Pacific

Reference has been made to the adoption of the metric system by Japan. That is another fact of far-reaching significance. It establishes definitely that the future trade of the Pacific will be upon the metric basis. Japan dominates the Far East, and has direct control over more than 100,000,000 people. China also is gradually advancing to the metric units, which are now widely used in commerce (especially at the treaty ports), on the railroads, in the army, and so on. In Java and the other Dutch East Indies the metric system is officially established, as it is in Siberia, Siam, the Philippines and French Indo-China. Everywhere in the populous Orient the metric system is coming into more exclusive use.

Obviously, the future commerce of the Pacific will be transacted in metric units. It is recognition of this fact that has impelled scores of Pacific Coast commercial organizations (including the World Trade Club of San Francisco) to petition Congress to hasten metric standardization thru legislation. Japan has announced its final advance to metrics; the Honolulu Chamber of Commerce has gone on record unanimously in favor of the Britten-Ladd Bill establishing

the metric system for American trade, and the Philippine Chamber of Commerce took like action. The largest Chamber of Commerce in the world—that in Los Angeles—has entered actively into the campaign to make America part of the metric world.

Perceiving that the trade of the Pacific and of all the world is to be on the metric basis, both legislative houses in Australia and New Zealand passed strong resolutions calling upon the British Imperial Conference to establish the decimal system of weights and measures thruout all lands under the British flag. It is a fact that every important self-governing colony within the "British league" (as General Jan Smuts calls it) has officially expressed a desire for metric standardization and has petitioned the "Home Government" to act. The Conference of Prime Ministers of the Self-Governing Colonies, and the Dominions Royal Commission wherein all these are represented, have urged a unified uniform advance to the metric system.

Britannia Will Advance With America

In view of all this, the trend toward adoption of the world standard units by the British Commonwealths is undeniable. Truly, as Andrew Carnegie said, "this is one of the steps forward that the Anglo-Saxon race is bound to take." And it is bound to be made by the British in the near future. Shall America not lead the way? Or shall America lag along at the very end of the procession, as the British have lagged in clinging to pounds, shillings, and pence when all the rest of the world has advanced to decimal coinage?

It is certain that when the United States adopts metrics, Britannia also will move—just as Canada already has followed us in adoption of decimal coinage. But if Britannia does not forthwith advance to metrics, it would then find itself truly isolated in the matter of weights and measures—all other trading peoples using the recognized world standards.

But Britain, too, will advance—and all the British Commonwealths likewise. Their future prosperity rests so intimately upon world trade that no longer can they tolerate obsolete trade methods rejected by all other civilized peoples.

The worldwide trend to metric standardization has been surveyed, and it has been seen that everywhere the logical decimal units are gaining ground—and antique local units are everywhere going down into the dark oblivion they deserve. Now the metric system is about to fulfill its manifest destiny. Before many years, it will be employed by all civilized humankind.

CHAPTER 4

THE CARNEGIE COMMITTEE METRIC REPORT

THE interest of American manufacturers in the metric units is not a new thing. Several years ago a report was made by a special committee of the American National Association of Manufacturers (now including 7000 leading concerns), which is a forceful presentation of the case for the exclusive use of the metric units—meter-liter-gram. It is here given, *revised to date by the chairman of that committee.* Because of the unique pre-eminence of one of the members before the whole world, this committee has been popularly known as the "Carnegie Metric Committee."

CARNEGIE COMMITTEE REPORT ON THE METRIC SYSTEM

Mr. President and Members of the National American Association of Manufacturers:

Your committee has devoted the whole year exclusively to the study of weights and measures, and now, in the 30 minutes allotted, respectfully submits the following facts, with the resultant resolutions:

When the tool-making animal, man, first wanted to barter or trade, the first tool he found he needed was "language." This language, in its most primitive form, may have been merely a smile or a frown, a picture, a symbol, a sign or gesture; or it may have been (as it was later) the spoken and written words and characters of a highly scientific people. But it always was of basic commercial importance. It is a vital part of the commercial life of humankind; and if it is simple, comprehensible by all, and standardized so as to be intelligible to humankind, it must be a potent factor in commercial development.

A very important part of the language of commerce is what is properly called the "language of quantity," or the standard units and divisions employed in determining weights and measures.

An Epoch-Marking Invention

In very remote times one of the most wonderful tools ever invented by humankind came into use in our present decimal notation.

It was supposed to be of Arabic origin, until proved to have been in use by a still earlier civilization, and as the Arabic language reads from right to left, while this little table of 10 characters reads from

left to right, the inference was plain that it was borrowed, not originated.

It is now proven that the Arabic language of quantity was taken bodily out of the Sanskrit; but the Arabs recognized its intrinsic merit, and about 900 A. D. they adopted into their language this wonderful decimal tool of trade—1, 2, 3, 4, 5, 6, 7, 8, 9, 0, which is the best trade tool of its kind in the world.

It is said that Julius Ceasar with Roman letter-numerals, I., II., III., IV., V., VI., VII., VIII., IX., X., could not, with all his ability, do the simple sums that an office boy can today in addition, subtraction, multiplication and division, with this wonderful science of positional decimal arithmetic. The Arabic notation is a labor-saving, trade-extending tool, and as a language of commerce it is today the only language that is absolutely universal. (See **all** keyboards of **all** typewriters in **all** languages, 1234567890.) These signs when written or printed are understood in **all** commerce everywhere, **all** over the world. The spoken words may be widely different, as:

English—One, two, three, four, five, so on.
France—Un, deux, trois, quatre, cinq, so on.
Spain—Uno, dos, tres, cuatro, cinco, so on.
Russia—Odin, dva, tri, totire, tiet, so on.
Germany—Ein, zwei, drei, vier, fünf, so on.

But they are **universally** understood when printed or written, as **1, 2, 3, 4, 5, 6, 7, 8, 9, 0.**

Metric System Due to James Watt

In the same way as the so-called Arabic notation was supposed to have originated in Arabia, so it has long been supposed that the application of the decimal to weights and measures originated in France. Later investigation, however, has traced it to James Watt, whose genius made possible the steam engine, steam pump, steam boat, steam railway and steam turbine. He thought his greatest work this measuring system, whose 3 principal units became meter-liter-gram. It is now known that he was the first to think out, design and successfully urge the adoption of the universal system of units of weights and measures, decimally divided, and so related that the establishment of any one of its parts would give the correct indication of all the rest. James Watt did this as early as 1783, and urged it for the use of humankind.

Watt's units of weights and measures decimally divided, tho not appreciated by the English king in his motherland, were warmly received by American, French and other scientists, statesmen, bankers, and business men, who saw that enormous worldwide benefits must accrue from the worldwide adoption of a system

of uniform units of weight and measure founded upon, and in combination with, the so-called Arabic notation. In 1783 steps were taken in France, and the principal commercial nations were invited to adopt the system. In America, Thomas Jefferson devised and submitted (4 July, 1786) a decimal system of weights and measures as good in every way as the metric. The trouble was the then American Legislators lacked the courage and "gumption" to adopt it, and thus America lost an opportunity to lead the world in decimal weights and measures, tho it led in decimal money by the adoption of the decimal dollar.

It would be interesting, if time permitted, to trace the growth and development of the decimal language of quantity in the preceding 138 years. It has been steadily perfected, and nation after nation has adopted it until today the metric decimal language of quantity is used practically by all the civilized world except 2 nations—the British and the Americans.

Typical British Objections

The objections to its universal adoption are fairly typified by the Englishman's criticism that, compared with his coinage, weights and measures, decimals are too intricate and complex. Yet the Englishman is surprised that Americans should regard his currency as at all bothersome, with its guineas, sovereigns, ½-sovereigns, pounds, ½-pounds, crowns, ½-crowns, florins, ½-florins, shillings, ½-shillings, 6-pence, ⅓-shillings, groats, 3-pence, ¼-shillings, pence, ½-pence, and farthings.

An eminent English lord said, "We don't want foreign things, even tho better. We have all the best of it—we can understand the metric units, but foreigners absolutely cannot understand ours. We've got 'em!"

But the Englishman's "objection" in no way applies to the United States of America, and there is no good excuse why we should not extend the decimal system, which we employ in American dollar-unit currency with such satisfactory results, and standardize American weights and measures with meter-liter-gram. Our money scale is simple and everywhere sufficient. The dollar unit is now firmly established, and satisfies all humankind. American units of weights and measures should harmonize with it—and with the world. In American money there are merely dollars and cents of dollars. Likewise we should have meter-liter-gram, decimally divided in the same way.

The most important view of this subject is its direct bearing on world trade. It is more especially the consideration of this point which prompts your committee to urge action now by this association

looking to the adoption by the United States of America of the 3 principal metric units of weights and measures, meter-liter-gram. In the opinion of your committee no single act of a similar nature would do more for the extension of American trade—would sell more American products at so small a ratio of expense.

Countries Now Using Metrics

The adoption of this language of quantity expression would instantly simplify and familiarize our commercial relations with the following countries: Argentina, Austria, Algeria, Albania, Brazil, Belgium, Bolivia, Bulgaria, China, Chili, Colombia, Costa Rica, Czecho-Slovakia, Cuba, Dutch East Indies, Congo, Denmark, Egypt, Ecuador, France, Finland, Filipines, Germany, Greece, Guatemala, Hungary, Holland, Haiti, Honduras, Italy, Iceland, India, Indo-China, Japan, Jugo-Slavia, Korea, Latvia, Manchuria, Mongolia, Mexico, Morocco, Montenegro, Norway, Nicaragua, Peru, Poland, Palestine, Paraguay, Panama, Porto Rico, Portugal, Russia, Rumania, Siberia, Salvador, San Domingo, Serbia, Spain, Switzerland, Sweden, Siam, Syria, Tunis, Turkey, Uruguay, Ukrania, Venezuela; and many others, making up altogether more than 200 countries.[1]

This is an Age of Progress

The law of the world is progress. When George Stephenson applied to the British Parliament for the right to run the first steam railway in the world, he met with the greatest opposition. As a final and conclusive proof of his folly, he was asked, "What would happen if a cow got in the way of your engine?" To the ultra-conservative mind there would be only one answer: overthrow of the train, and destruction of life and property. But Stephenson replied calmly, "It would be bad for the cow."

We need to apply this literally. We live in an age of marvelous progress. We now have machines of science which annihilate space and enable us to hear, and talk, and fly, over the distance of a continent or an ocean; we have machines which reproduce the speech of yesterday in its exact voice or tones, and transmit to us the actual photograph of the speakers. Humans are equipt with inventions which will compel them to overcome false, farcical conservatism. There is clearly no obligation to retain in our later and higher civilization any more of the past than is entirely suited to our absolutely altered conditions. There is equally the necessity to find new tools for our new and greater needs, our worldwide requirements, eliminating all waste and scrapping the old framework of past customs as we discarded the skins, blankets and paint of our ancestors for the modern clothes, furnishings and equipment of the citizen.

[1] See Map pages at the beginning of this volume.

The Associated Chambers of Commerce of the British Empire in their convention at which 32 Canadian delegates were present, passed the following resolution:

"**Whereas,** The British weights and measures, which vary constantly in every part of the British Empire and the United States of America, are a source of constant annoyance, costly errors, loss of time, loss of labor, loss of wage-paying trade, and a formidable obstacle to local and world commerce; and whereas the metric system has now been universally recognized as the most perfect decimal system, and it is generally adopted by all nations of all continents, with the exception of the British Commonwealths and United States of America, therefore, be it

"**Resolved,** That the metric system of weights and measures be adopted without further delay by the several British governments—the yard being extended to the meter,[1] the quart to the liter, and the pound avoirdupois to the 500 grams."

The Decimal Associations of America and Britannia, centered in New York, London, and Manchester (and the World Trade Club of San Francisco) count among their members and collaborators the most eminent of the English-speaking peoples. The project they support should now receive the hearty co-operation of business men everywhere in the United States of America and the British Commonwealths. It is assured that if the decimal metric system of weights and measures is adopted by United States of America, its adoption by the British Commonwealths will immediately follow. Thus the metric system will become the language of quantity expression for all humankind; and written or printed quantities, dimensions, in the English language will then be comprehended at once everywhere they are read. Our communications, price lists, newspaper, mail, telegram, airgram quotations will then be understood thruout the world. It is unnecessary to point out to business men the enormous commercial value which this will bring to the United States of America.

In conclusion, your committee respectfully submits its findings, the result of a year's work, as follows:

Whereas, For over 138 years the metric system of weights and measures invented by the world's greatest engineer, James Watt, has been used by world science and its units are now employed by more than 200 countries, and has attracted the attention of American and British legislative committees, special and select commissions, British and American Boards of Trade and Chambers of Commerce in all parts of the English-speaking world, with the result that they

[1] The meter is the yard plus 10%; the 500 grams is the pound avoirdupois plus 10%; the liter is 5% more than U. S. American liquid quart and 13% less than British liquid quart.

have since 1866 invariably urged its adoption; and moreover, that an enormous literature in advocacy of it is to be found in the world's libraries, and,

Whereas, During this time the system has received thoro scientific investigation; has been used by world science and world commerce; has been taught in schools thruout the world; while practically all nations but 2 have adopted it exclusively or use its units, with much greater ease and satisfaction than they anticipated, with enormous commercial advantages to themselves and humankind, and,

Whereas, It is now admitted by all who have thoroly examined it that the adoption of the decimal system of weights and measures by these 2 nations is inevitable, and that the time has now come for them to use it exclusively in war and peace, therefore

Resolved, That the American National Manufacturers Association earnestly recommends the enactment of legislation which will secure this advantage to the United States of America, by making the metric system of weights and measures its exclusive legal units of weights and measures, and

Resolved, That, following well-known precedent, exceptions shall be made (1) in completing the survey of the public lands; (2) that existing machinery, tools, implements, gages, dies, drawings, designs, and so on, be continued in use until worn out; but such shall not be replaced except when dimensions are described in accordance with the metric standards of the world bureau of weights and measures, of which the United States of America and the British Commonwealths are members.

Resolved, That this committee shall be authorized to invite the co-operation of every organization, association, corporation or individual, willing to assist in this progress.

Resolved, That every person interested be invited to send to the chairman of this committee any facts or suggestions that may be of service.

COMMITTEE ON LANGUAGE, WEIGHTS AND MEASURES

Albert Herbert, chairman, president of Hub Gore Makers (Manufacturer, Rubber Elastic Products), Boston, United States of America.

Charles A. Schieren, of C. A. Schieren & Co. (Manufacturer, Leather Belting), New York City; ex-mayor of Brooklyn.

Charles H. Harding, of Erben Harding & Co., Manufacturer of Textiles, Philadelphia, United States of America.

Andrew Carnegie, (Manufacturer of Steel and Steel Products), Cluny Castle, Kingussie, British Isles.

Henry Fairbanks, Manufacturer, vice-president of E. and T. Fairbanks Scale Co., St. Johnsbury, Vt., United States of America.

Theodore C. Search, Manufacturer, president and founder of American National Association of Manufacturers.

The only member of the committee not personally present submitted this letter:

"Albert Herbert, Chairman Metric Committee, National American Association of Manufacturers, 91 Bedford Street, Boston, Mass., United States of America:

Dear Sir: In reply to your request that I should express my opinion of the metric system of weights and measures, I beg to say that that system is one of the steps forward which the race is bound to take sooner or later. Our present weights and measures, inherited from Britain, are unworthy an intelligent nation today. The advantage we possess over Britain in our decimal dollar system as compared with their pounds, shillings and pence, would be fully equalled by the adoption of a metric system of weights and measures.

Very truly yours,

(Signed) ANDREW CARNEGIE."

A letter to the committee from W. P. Wilson, Director of World Trade Museums, Philadelphia, read: "It will be a happy and profitable day for the United States of America and for the British Commonwealths when they adopt metric weights and measures."

It was following this report that Theodore C. Search, founder and president of the American National Association of Manufacturers advocated metric standards legislation before Congress. He declared: "Wherever manufacturers undertake to extend trade outside of the United States of America and the British Commonwealths, they encounter meter-liter-gram, the only weights and measures uniform thru all the world."

CHAPTER 5

THE WORLD TRADE CLUB ADVOCATES METRIC STANDARDIZATION

THE Carnegie Metric Committee report was epoch-marking. It signified active and general inquiry by American business men into the subject of metric standardization. With cumulative force the metric movement grew, and organization after organization entered into the activity to secure for the United States of America the advantages of the logical decimal units—and world uniformity.

Business Men Actively Urge Metrics

Then came the World War, and America's participation in gaining the ultimate victory. The desperate need for world standardization in securing that victory led America to adopt the metric standards for war purposes. The success attendant upon this move was not lost upon keen-visioned American business men, seeking methods for increasing national and international efficiency. They determined that the United States of America should profit permanently from this lesson of the great conflict. Peace must have its victory as well as war.

Nowhere was interest more alive than upon the progressive Pacific Coast. The race for the trade of the Pacific was growing intense. Already it was seen that Japan was going entirely upon the metric basis. Already it was perceived that Germany would come into the rich markets of the Orient and would seek to seize supremacy there, utilizing the simple and understandable world language of quantity—meter-liter-gram.

The World Trade Club, an organization of 500 leading merchants and manufacturers, with headquarters in San Francisco, but with corresponding members all over the world, declared that the United States of America could no longer be handicapped in the great contest for commerce by clinging to obsolete tools of trade. This Club, which already had achieved much in promoting American world commerce, decided to actively advocate metric standardization for the United States of America and for other countries not yet standardized.[1]

---

[1] In its local activities, the organization has used the more local title of Foreign Trade Club of San Francisco. But in the conduct of the worldwide metric advocacy, because of its international character, by vote of the members it was decided to use the broader title, *World Trade Club*. The official weekly publication of the organization is entitled "World Trade."

Besides the world standardization movement, the Club has urged such measures as the development of the United States commercial diplomatic service; the stabilization of foreign

An Educational Metric Campaign

William H. Hammer, President of the World Trade Club, designated a group of members to direct the metric educational work of the organization. One member was deemed eminently fitted to successfully undertake this duty, having been for many years a practical manufacturer and world merchandiser, and having served as Chairman of the Carnegie Metric Committee of the American National Association of Manufacturers, which committee reported unanimously for metric standardization.

A letter-booklet on metric standardization (called "Keep the World War Won") was prepared—then another, "Metric Units to Unite the World." It was thought that these were sufficient to cover the simplification of the language of quantity to meter-liter-gram. But correspondents wrote, "What Will Metric Standardization Cost?" Still others asked, "Who Urges Meter-Liter-Gram?" and "Who Suffers?" These questions were answered in specially-prepared booklets; and "An Evening at the World Trade Club" was issued to describe typical activities of that organization. At length many wrote, "In the name of common sense, does anybody object to this metric advance?" So the answer was disclosed in the booklet, "Who Opposes?" Organizations wrote that they would need to have a team appointed to "look it up" and asked that a list of sources be sent them; and accordingly another booklet was prepared, containing world metric literature clues, "Look It Up." This is reprinted as Chapter 14 of this book; and in it are listed and described the 14 different pamphlets published by the World Trade Club. An educational metric leaflet, called "The Metergram," was also issued.

In the World Trade Club metric booklets, the readers were urged to write their national legislators to enact metric standardization laws, adopting the metric units for exclusive use. As a result, with the aid of hundreds of other organizations, all working together, more than 103,000 individual petitions urging metrics have been sent to the United States Congress—and the petitions still continue. Approximately an equal number of metric petitions has been sent to the British Parliament.

World Trade Club Applauded

From all over the world have come commendations and congratulations to the World Trade Club for its activity in advocacy of metric standardization. Commenting on the first metric leaflet sent out by the World

---

exchange by suitable banking legislation; the promotion and upbuilding of the American merchant marine; the removal of disabilities and inequalities in marine insurance and in the application of tariffs; the expansion of cable, wireless and postal communication throughout the world; the establishment of "free zones" at the Port of San Francisco, and other ports; and the encouragement of scientific educational study by Americans of world trade institutions and problems.

Trade Club, Charles Marcil, House of Commons, Ottawa, Canada, wrote: "I have found your letter unanswerable. The progress you advocate is important and should be brought about as soon as possible." J. J. Shea, Bellevue Place, Clonmel, County Tipperary, Ireland, wrote: "During the 28 years for which I was a member of the British House of Commons, I never received any pamphlet, in advocacy of any progress, more concise or more convincing than yours in favor of Meter-Liter-Gram."

William G. McAdoo, wartime Secretary of the United States Treasury Department, wired (16 May, 1919): "I heartily applaud activities of World Trade Club in favor of legislation providing for exclusive legality within the United States of America of decimal metric system of weights and measures. Any legislation enacted would of course take due care of commercial interests during reasonable period of transition, and consequently alarm because of the change is wholly groundless."

Charles R. Lanman, Expert on Oriental Languages, Harvard University, wrote: "I have watched the good work of the World Trade Club to make this dull-witted world a bit more intelligent. Gratitude to you for your labors. Keep on—I, too, will keep on." Writing to the World Trade Club, I. B. S. MacIlwaine, Royal Hibernian Academician, County Tyrone, Ireland, said: "Thank you for the very illuminating pamphlet you so kindly sent me; I will most certainly give every assistance in my power and have pleasure in stating that I have just returned from Dublin, where the manner in which you have compiled the pamphlet and the masterly way you have simplified details has been the admiration of those business men who are concerned and competent to judge."

These are but typical of hundreds of expressions of commendation received by the World Trade Club.

Obstructionists Start Campaign of Slander

On the other hand, as in all such forward movements, antagonism was stirred up in the hearts of some—especially by a small but very noisy clique of obstructionists who have for years been hired by certain selfish interests to fight world standardization. After the manner of their kind (and following the lead of German world propagandists) they began a campaign of persecution and misrepresentation. Altho other organizations were working strenuously for metric standardization, they centered their attack on the World Trade Club. Altho many other members also were active in the metric advocacy, and their public statements urging metrics were widely quoted in the press of America and the world, the obstructionists singled out for special persecution the member who had been Chairman of the Carnegie

Metric Committee of the National American Association of Manufacturers, which committee reported unanimously in favor of the metric units. With bitterness born of paid-for malice, antagonists spread misinformation broadcast, backed by limitless propaganda funds from some source never fully revealed. To deceive the public, and particularly to halt action by Congress, they sought to cloud the issue. Their attack was directed not so much against the metric system as against those who advocate it. Thus they sought to divert the public attention from the urgency of world standardization, and at the same time to intimidate the metric advocates thru the "frightfulness" of their invective and the ruthlessness of their attack.

An Unwarranted Attack Answered

These assaults were denounced as malicious by hundreds thruout the United States of America, familiar with the standing and honorable record and unselfish patriotism of the World Trade Club; yet a few were unfortunately misled by the anti-metric propaganda. One particularly insolent attack was circulated by the editor of a "textiles" paper (not the leader in its field), and this brought forth an answer from a member of the Club, John H. Gerrie, in his "Pan-Pacific Magazine."

To the other, Editor Gerrie replied[1]: "I have your note written on your personal card suggesting that I might find a good story in your attacks upon the World Trade Club, the Metric System and Albert Herbert. I have taken the trouble to read the abusive circular letter you enclosed, which, pardon the allusion, sounds suspiciously like **German World Trade and World War Propaganda.**

"Before acting upon your suggestion or answering your request I have taken the time to investigate the World Trade Club, to study a little more closely the growth and present extensive use of the metric units and to look up the record of Albert Herbert.

"Since you have not minced words in your attempted excoriation of the noble efforts of a practical philanthropist and a public-spirited organization to accomplish good for humankind, I will reply as freely concerning my 'discoveries' as to the basis of the good story you so ingeniously suggest and request.

"As to the World Trade Club: That is the broader title assumed for its world work by an organization of 500 live-wire manufacturing merchants engaged in world commerce, whose local activities are conducted under the more local title of Foreign Trade Club of San Francisco. For its metric campaign objection was taken, on excellent grounds, to the inference of the word 'Foreign' as applied to Canada,

[1] This reply was published in booklet form, "World Trade Club—Attacked!" (World Trade Club book 6. Price $.02.)

Australia, New Zealand, Tasmania, United South Africa, British Isles, France, Italy and other allies of the United States of America in the World War so recently concluded. Brothers-in-arms in **Saving Civilization,** they ought to be and are brothers-in-arms in easing the way for world trade—despite devious efforts of the late military enemy to force the retention of the heavy handicap of un-uniform **Antiquated and Cumbersome Weight and Measure Units.**

"As to the Metric Units: When it is recalled that among 212 countries, comprising 82 per cent of Earth's population, metric units are, or are in process of becoming almost exclusively employed in world trade, the activities of **German Propagandists** to keep British and American commerce out of this potential circle will be readily understood. That any American publication, daily, weekly or monthly, could so palpably play into the hands of Germany by attempting to interfere with the movement to bring the United States into the **World Metric Family,** would seem to be a better story than the one you suggest."

Replying to the unwarranted attack on an active worker in the World Trade Club metric advocacy, Editor Gerrie wrote: "Your grievance appears to be particularly bitter toward this man (Albert Herbert), whom you apparently have singled out for persecution following well-known German propaganda tactics. On investigation, I find his a Record of public zeal and achievement that has few parallels among public benefactors who started the race of life at scratch. His object, to do good to All Humankind and to injure none, has in this particular work taken the particular form of helping to remove the largest obstacle to the unhampered interchange of trade among all nations and all peoples; hence his leadership in the movement to put all the world on a metric basis. To that movement he gives unsparingly of his time and apparently devotes a considerable part of his wealth." Editor Gerrie showed furthermore that attacks by anti-metric obstructionists are due to long animus against "the chairman of the famous Carnegie Metric Committee that after a year's investigation reported favorably on the adoption of the metric system by the United States of America."

An Evening at the World Trade Club

In the course of the metric campaign, the World Trade Club membership has time after time repeated its adherence to the cause of world standardization of weights and measures. One such occasion deserves particular notice, since the program of the evening was devoted entirely to this important topic.

On the evening of 18 June, 1919, members and guests gathered for the regular informal supper of the organization, held in the Hotel

St. Francis, San Francisco. The banquet was given entirely to the social interchange of ideas, with no formal speeches. When it was completed the party adjourned to the near-by Assembly Hall of the Chamber of Commerce Building, where a large audience was gathered. President W. H. Hammer called the meeting to order. After the reading of the minutes, Secretary William E. Hague produced a sheaf of letters and telegrams received from all parts of the world, a score or more of which he read, indicating the wide-spread and active interest that has been aroused in the universal adoption of metric units. He said: "The World Trade Club is receiving thousands of letters and telegrams from commercial centers everywhere, endorsing and earnestly urging the exclusive use of metric units in modern business and giving good and sufficient reasons for making this progress to a scientific basis for the business of the world." Among those whose opinions in favor of metrics were cited were Andrew Carnegie, Henry Ford, John Hays Hammond, W. G. McAdoo, Franklin D. Roosevelt, James Speyer, Theodore N. Vail, Otto H. Kahn, George W. Perkins and many others.

At the conclusion of the reading of the letters and telegrams, which were greeted with manifestations of approval by the audience, President Hammer introduced Aubrey Drury, Associate Editor of the *Journal of Electricity*, the speaker of the evening. Editor Drury presented an address on "Metric Units and World Trade," which is reproduced at length elsewhere in this volume.[1]

Modern Merchandising Demands World Uniformity

In the course of his remarks, he declared: "There is an immediate connection always between the production of goods and the merchandising of goods—that is something for our merchant-manufacturers to contemplate. Think of the vast advantages in merchandising goods thru all the world using a uniform system of weights and measures. Think how we could put this time-saving tool into operation everywhere. How convenient it would be for us, also, to utilize this 'world language of quantity.'

"We Americans take pardonable pride in our ingenious labor-saving devices. We have invented and used a great many, yet appear reluctant to accept the greatest of them all, the invention of one of our own race, James Watt. That strange reluctance is entirely at variance with the pioneer spirit of our nation and with the progressive age in which we live."

In concluding his remarks, Mr. Drury pointed out how appropriate it is for world traders to take the leadership in the standardization movement. He stated: "In the merchants of the United States of

[1] See "Metric Units and World Trade," by Aubrey Drury, in Chapter 13, "Selected Articles on the Metric System."

America, and Britannia, confidence may safely be placed to continue in the work of world education, which seems theirs by right of enterprise. They can be trusted to confer another great benefit on all humankind, to aid powerfully in carrying into effect everywhere among English-speaking peoples the universal language of quantity, meter-liter-gram."

A Unanimous Resolution

After a general discussion of metric standardization by the membership, C. E. Hydes, Vice-President of the club, arose and addressed the gathering. He expressed high appreciation of the way in which the subject had been set forth, and offered the following resolution, requesting that it be considered at once.

"Resolved, by the World Trade Club, that we respectfully urge that the units of the Metric System be adopted by the Congress of the United States of America and the British Parliament as the exclusive legal standards of weights and measures.

"Further Resolved, that copies hereof be forwarded to the President of the United States of America, and the British Premier, and other legislators concerned."

The resolution was adopted *by unanimous vote,* followed by applause.

With its aid to the metric cause thus pledged, the organization[1] has consistently worked to secure for the people of the United States of America the benefits of the decimal system of weights and measures. It co-operated especially in making a success of the World Metric Standardization Conference, held in the Palace Hotel, San Francisco, 17 May, 1920. Fully 500 people were gathered together on that occasion, and they went on record unanimously for the world standards.

President W. H. Hammer and Secretary-Treasurer William E. Hague, at the request of the American Association for the Advancement of Science, sent papers on the need for metric standards for presentation before the annual convention of that organization held in St. Louis, Missouri[2]. Mr. Hammer was also elected President of the World Metric Standardization Council, and Mr.

[1] The officers of the World Trade Club (Foreign Trade Club of San Francisco) in February, 1922, were: H. W. Glensor, President; C. A. Maydwell, 1st Vice-President; R. C. Force, 2nd Vice-President; H. N. Thomas, 3rd Vice-President; N. A. Davis, Managing Director; Aubrey Drury, Secretary. The Executive Committee: E. G. Babbitt, U. S. Federal Bureau of Foreign and Domestic Commerce; M. H. Cook, H. N. Cook Belting Co.; Ben C. Dailey, B. C. Dailey & Co.; N. A. Davis, publisher "World Trade;" William A. Day, U. S. Federal Reserve Bank; H. J. Ellen, Byron Jackson Machine Works; R. C. Force, C. L. Best Tractor Co.; H. W. Glensor, Glensor, Clewe & Van Dine; William E. Hague, Builders Exchange, Oakland; W. H. Hammer, Hammer & Co.; C. E. Hydes, Marine Department, Fireman's Fund Insurance Co.; G. I. Kinney, International General Electric Co.; H. W. Knoll, L. P. Fisher Advertising Agency; C. A. Maydwell, The Maydwell Company; H. N. Thomas, China Mail Steamship Company.

[2] For reprints of these addresses, see this volume, Chapter 13, "Selected Articles on the Metric System."

Hague has served on its advisory committee. In November, 1919, Mr. Hague departed on a business tour of the Orient, and Aubrey Drury was elected to succeed him as Secretary-Treasurer.

Successful Progress of the Metric Movement

The World Trade Club metric movement all this time gained momentum, and organizations thruout the world joined in co-operation to bring about world unity of weights and measures. The Board of Directors called upon the Chamber of Commerce of the United States (in which the organization has membership) to hold a nationwide Referendum on the subject. Many other member organizations joined in this petition, and as a consequence the national Chamber of Commerce appointed a special Metric System Committee to study and report, with a nation-wide Referendum in prospect. Ben C. Dailey (who succeeded W. H. Hammer as President of the Club) was named as a member of this committee and made trips across the continent to Washington and New York to attend committee meetings, unselfishly giving his time to this cause in the interest of world unity of standards.

Co-operation on the part of the membership, and assistance from hundreds of other progressive organizations thruout the world, have made the metric advocacy of the World Trade Club doubly effective. There is an awakened public opinion in favor of the world standards, indicated by the extensive discussion of this question by the Chamber of Commerce of the United States; by the favorable comment of the Press, and above all by the prominent position metric standards legislation is assuming before the Congress of the United States of America.

CHAPTER 6

ORGANIZED EFFORT FOR WORLD METRIC STANDARDIZATION

ORGANIZATION is the fundamental of success. The success and rapid progress of the metric standardization movement within the United States of America during recent years is due to Organization—not to any single organization, nor to any group of organizations, but rather to the combined effort of hundreds of associations working effectively together. Their united purpose has been to secure the benefits of the world standards for the United States of America.

The preceding chapter has indicated what one earnest organization with the world viewpoint has accomplished in directing public attention to this vital issue. In the next chapter, the activities of the World Metric Standardization Council will be detailed, and an indication given of its work in co-ordinating metric effort everywhere. The organized decimal campaign thruout Britannia, also, is further described in a later division of this volume. Here it is proposed to survey the associations, national and local, within the United States of America which are active in urging metric legislation. The metric work of international associations in which the United States is largely interested will also be outlined.

Vast Organized Metric Support

In a movement so broad and comprehensive as the metric movement, in which many factors participate, it is often difficult to designate those which have accomplished most. Each organization has its own way of aiding the cause of world standardization. Some publish material for distribution, advocating metrics; some concentrate their effort upon obtaining legislative support for the metric standards; still others devote their energies to unifying their members in advocacy of the decimal metric advance, often securing the actual and successful employment of metric units thruout important industries. Local organizations often aid the cause by holding public discussions upon this vital topic, and by the appointment of special standardization committees.

Thus the metric advocacy is characterized by a variety of method, which adds greatly to its effectiveness and does not detract from its singleness and unselfishness of purpose. It is remarkable, too, for the broad range of support accorded it. Whereas virtually all the

organized obstruction to the metric advance comes from one small group, the movement is being urged by associations as broad as the nation itself, and representing every vocation—organizations of manufacturers, merchandisers, packers, builders, growers, inventors, scientists, educators; organized labor; organized farmers; organized women; organized warriors; and, in fact, associations of every kind.

Organized Public Opinion

"Let all aid in their own way"—this is the program upon which the metric movement has gone forward. Forces are working now within the American nation—forces of economy, reason and logic—impelling the advance to world standardization. Because of the extent of this popular urge, it cannot be fully gaged. Competent investigators have reported that practically all Americans who have considered the matter favor the decimal metric system; that the minority which opposes it is microscopic. The popular demand for metrics is stated in concrete form by the 103,000 petitions today before the United States Congress urging metric standards legislation—petitions directly representing many millions of voters. These metric petitions may truly be said to represent the **organized public opinion** of the United States of America. This is the organized force which is working for metric standardization today. Let it be remembered that all other effort by organizations and individuals indicated in the present volume is but a manifestation of this greater national and international movement.

American Metric Association

In the forefront of the organized forces working for metric standardization is the American Metric Association. This association was established in 1916, carrying forward and directing an educational metric movement then definitely under way. The teachings of the World War as to the necessity for world metric standardization gave dramatic force from the outset to the patriotic work of the American Metric Association. The association has done much to unify and focus support for metric standards thruout the United States of America, and has rendered a very practical service in facilitating the introduction and actual use of metric units in hundreds of industrial concerns. It has effectively impressed upon the United States Congress the need for prompt adoption of the metric units, and has been ably represented in the hearings before the Congressional metric committees. Its publications on metric standardization have been widely distributed, and their scope and value are indicated in Chapter 14 of the present volume, "Look It Up."

The American Metric Association works in co-operation with the World Metric Standardization Council, the World Trade Club, the British Decimal Associations, and has amongst its own membership such powerful metric urgers as the American Association for the Advancement of Science, American Chemical Society, American Drug Manufacturers' Association, American Institute of Chemical Engineers, American Pharmaceutical Association, American Association of Retail Druggists, National Canners' Association, National Scale Men's Association, National Wholesale Druggists' Association, National Wholesale Grocers' Association, and many others.

Conventions of Metric Urgers

The Annual Conventions of the American Metric Association have attracted wide interest. They have been held in New York City, Chicago, Baltimore, St. Louis, Pittsburg and Toronto, and the American Metric Association was represented by its Secretary, and by many other delegates, in the great World Metric Standardization Conference in San Francisco, 17 May, 1920. Notable speakers have addressed all these gatherings. Among those who have spoken before the American Metric Association are: William C. Redfield, for 7 years United States Secretary of Commerce, and 2 times President of the American Manufacturers' Export Association; Samuel Vauclain, President of the Baldwin Locomotive Works; Fred J. Miller, President of the American Society of Mechanical Engineers; F. O. Wells, for 20 years President of the Greenfield (Mass.) Tap, Die, Machine Tool Co.; Jesse M. Smith, former President of the American Society of Mechanical Engineers; George F. Kunz, Vice-President of "Tiffany's" and world's greatest gem expert; J. H. Dunlap, Goodyear Tire and Rubber Co.; H. T. Wade, Editor, New International Encyclopedia; C. A. Adams, Consulting Electrical Engineer; A. E. Kennelly, Consulting Electrical Engineer, and Professor at the Massachusetts Institute of Technology, and Harvard University; John Barrett, Director-General of the Pan-American Union; W. C. Wells, Chief Statistician of the Pan-American Union; J. W. McEachren, Crane Valve Co., Chicago, Illinois; F. R. Drake, of Drake & Co., Easton, Pa.; C. O. Mailloux, President of the International Electrotechnical Commission; Major Louis A. Fischer, Chief of the Division of Weights and Measures, United States Bureau of Standards; David A. Molitor, Consulting Engineer, Detroit; G. H. Coakley, Manager of the Supply Department and Purchasing Agent of the Automobile Club of America; Dr. Henry L. Taylor, Board of Education of the State of New York; Joseph J. Holwell of the Mayor's Bureau

of Weights and Measures of the City of New York; Walter Wood, President of the Wood Iron and Steel Company, Philadelphia, and scores of other eminent authorities.

The American Metric Association has headquarters at 156 5th Avenue, New York City, and also has sections in various parts of the country. The officers for 1922 are George F. Kunz, President; William Jay Schieffelin, Treasurer; and Howard Richards, Secretary. Among the hundreds of members of the American Metric Association are numbered such men as Alexander Graham Bell, Joseph V. Collins; Gano Dunn, President of the J. G. White Engineering Corporation; Irving Fisher; J. E. Fries, of the Tennessee Coal, Iron & Railroad Co. (steel manufacturers); Albert Herbert; Jeannot Hostmann; Rear-Admiral T. W. Kinkaid, U. S. Naval Engineering Experiment Station, Annapolis, Maryland; A. S. Krebs, Treasurer of the Krebs Pigment & Chemical Co., Newport, Delaware; Fred Mason, President of the Shredded Wheat Co., Niagara Falls, New York; Major Fred J. Miller; Everett Morss, President, Simplex Wire & Cable Co., Boston, Mass.; Charles P. Steinmetz, world electrical expert, Schenectady, New York; Dr. S. W. Stratton, Washington, D. C.; William L. Sweet, Rumford Chemical Works, Providence, R. I.; William C. Wells, Pan-American Union, Washington, D. C.; Frank O. Wells, Greenfield, Mass.; Arthur P. Williams, New York City; Theodore F. Whitmarsh, New York City, and others of like high standing in business and world affairs.

Great Industrial Concerns Aid

The list of great industrial concerns holding firm membership in the American Metric Association is too long to be given here in full. Among them are the American Can Company; Apothecaries Hall Company; Austin Nichols & Co.; Bayer Company; Beech-Nut Packing Company; R. L. Craig & Co., Los Angeles; Crane Company; Crocker-Wheeler & Co., Ampere, N. J.; De Laval Separator Co., Poughkeepsie, New York; Detroit Stove Works; Diamond Crystal Salt Co., St. Clair, Michigan; Eimer & Amend; Foulds Milling Co., Chicago; Franklin Sugar Refining Co., Philadelphia; Frank L. Fuller & Co., New York City; General Electric Company; Genesee Pure Food Co.; Getz Brothers & Co., San Francisco; Goerz American Optical Co.; Goodyear Tire & Rubber Co.; Haas Bros., San Francisco; Kellogg Toasted Corn Flakes Co.; Lawrence & Co., New York City (cotton goods); Lindley & Co., wholesale grocers, Sacramento, California; Lufkin Rule Co.; Mendelson Corporation, New York City; Merrell Chemical Co., Cincinnati; Michigan Drug Co., Detroit; Minute Tapioca Company; Pfanstiehl Company, North Chicago, Illinois; Raymond

Concrete Pile Co., New York City; Rendrock Powder Co., New York City; Rumford Chemical Works; Runkel Brothers, New York City; Seacoast Canning Co., New York City; The Shredded Wheat Co.; S. K. F. Ball Bearing Co.; Square D Company, Detroit; Sussman, Wormser & Co., San Francisco; The O. & W. Thum Co., Grand Rapids, Michigan; R. C. Williams & Co., New York City; The J. B. Williams Co., Glastonbury, Connecticut; American Insulated Wire & Cable Co. and many others.[1]

National Wholesale Grocers' Association

Prominent among the organizations which have worked consistently for metric standardization in the United States of America is the National Wholesale Grocers' Association. On 27 October, 1921, Arthur P. Williams of New York City, representing this great national organization, appeared before the United States Senate committee holding hearings on the metric system. He testified: "The National Wholesale Grocers have a membership of 868 of the largest firms and corporations in the grocery business in the United States. We employ approximately 275,000 people and do a business of over $3,000,000,000. For 10 consecutive years we have passed a unanimous resolution in favor of the immediate adoption of the metric system."

Typical of these resolutions is one passed at the Liberty Convention of the National Wholesale Grocers' Association, in Chicago, 22 June, 1917: "That we endorse the efforts of the American Metric Association in furthering the use and adoption of the metric system in the United States by every means at our disposal, including financial assistance." The special Metric System Committee of this great commercial organization has been particularly active, and its valuable reports have been printed in the proceedings of the annual convention, since 1912. The National Wholesale Grocers' Association had delegates at the World Metric Standardization Conference, held in San Francisco, 17 May, 1920; and it is ably represented on the Metric System Committee of the Chamber of Commerce of the United States by Major Fred R. Drake of Easton, Pennsylvania.

The National Wholesale Grocers' Association has long urged its members to adopt the metric weights and measures on the labels of canned goods and other food products; using a double marking, including the old "British" or "American" weight or measure, where required. This policy has been adopted as of vast educational value to the public, and particularly to develop the

[1] To join the American Metric Association, apply to the Secretary, 156 5th Avenue, New York City. Individual membership, $2 a year; firm or corporation, $5 a year; organization, $10 a year; contributions gladly received in behalf of metric standardization.

world trade of the United States of America. Billions of these metric labels have been printed and used.

It should be emphasized that the Grocery business thruout the United States is a unit in advocating the advance to metric standardization. Many State organizations, wholesale and retail, have gone strongly on record in favor of the metric system. Such, for instance, is the New York Wholesale Grocers' Association, comprising 126 of the largest wholesale grocery houses in the State of New York, doing an annual business amounting to over $300,000,000, and employing more than 58,000 workers. The Retail Grocers' Association of the United States has also been active in behalf of metrics.

Organized Pharmacy Unanimous for Metrics

Another powerful national commercial organization which has long supported the metric cause is the National Wholesale Druggists' Association. At its 1921 convention, held in Atlantic City, N. J., this association passed resolutions unanimously in favor of the world standards. The National Association of Retail Druggists, National Drug Trade Conference, National Association of Drug Clerks and other organized units of this vast business are active in urging uniformity of weights and measures thru general adoption of meter-liter-gram.

On 25 October, 1921, S. L. Hilton, President of the American Pharmaceutical Association, testified before the United States Senate committee investigating metric standardization. He declared: "The American Pharmaceutical Association has repeatedly gone on record favoring the metric system." The latest metric resolution was carried at the annual convention in New Orleans, August, 1921. President Hilton calls attention to the fact that the United States Pharmacopoeia and the National Formulary use the metric units exclusively.

American Chemical Society

The chemical industry ranks second, next to iron and steel, amongst the manufacturing industries of the United States of America. It is significant that this great industry is predominantly inclined toward exclusive use of the world metric standards. One important division of it, the American Chemical Society, is unanimously in favor of the metric system and is taking a leading part in the campaign to "make America metric."

Testifying before Congress on 28 October, 1921, Dr. Charles L. Parsons, Secretary of the American Chemical Society, declared: "Our members use the metric system solely in their work. Among our 15,200 members, to the best of my knowledge and belief, there is not a single one opposed to this metric system

bill (the Britten-Ladd Bill), but they are all in favor of it." On 14 December, 1918, the council of the American Chemical Society, consisting of representatives elected by its 60 local sections thruout the United States, unanimously voted: "That the American Chemical Society heartily favors the universal adoption of the metric system, as far as possible, to the exclusion of all others, and that the committee on foreign chemical trade be requested to use its influence to have the metric system adopted in America's foreign trade in order that this country may compete in foreign countries for trade at least on an equal basis with Germany and other countries that already have adopted this simplest and most perfect system of weights and measures."

On 12 April, 1920, the council voted unanimously: "That in order to promote the cause of metric standardization the American Chemical Society should join heartily with the World Trade Club of San Francisco, with the American Metric Association, and with the London and Manchester Decimal Associations in forming a world metric standardization council, in calling a conference in San Francisco on 17 May, 1920, with the object of promoting adoption of the meter-liter-gram system in the United States and thruout the world."

Dr. Parsons says, "We have always, on all occasions, taken the stand, without one adverse vote, even in our large meetings where hundreds have been present, in favor of the adoption of the metric system." The American Chemical Society has a most active Metric System Committee, under the chairmanship of Eugene C. Bingham, Lafayette College, Easton, Pa. This committee has conducted a systematic referendum among the universities and colleges thruout the United States of America, and virtually all of these have signified their intention to order chemicals and supplies in metric units only. The Metric System Committee has also gained widespread support for the metric standardization campaign from chemical manufacturers.

National Organizations Urging Metric Standardization

Besides those already indicated, more than 100 great national organizations have participated actively in the metric standardization campaign. It would be impossible to recount in a volume of this size all the strong effort which they have put forth in behalf of this movement for world uniformity. In the resolutions and statements given later in this chapter there will be found further record of their participation in the metric advance. Herewith is presented a list of some of the national organizations which urge world metric standardization of weights and measures:

NATIONAL AMERICAN ORGANIZATIONS AMONG THOSE URGING GRADUAL METRIC STANDARDIZATION OF WEIGHTS AND MEASURES.

National Research Council
Associated General Contractors of America
United States Sugar Manufacturers Association
National Salt Producers Association
National Association of Loose Leaf Manufacturers
National Paper Box Manufacturers Association
National Ornamental Glass Manufacturers Association
National Manufacturers of Soda Water Flavors
National Refrigerator Manufacturers Association
National Tent and Awning Manufacturers Association
National Sewing Machine Manufacturers Association
National Mirror Manufacturers Association
Association of Flower and Feather Manufacturers of America
American Walnut Manufacturers Association
American Specialty Manufacturers Association
National Manufacturing Perfumers Association
National Box Board Manufacturers Association
National Association of Printing Ink Makers
The 4-One Box Makers Association (National)
National Wholesale Grocers Association
Retail Grocers Association of the United States
National Canners Association
National Preservers and Fruit Products Association
American Institute of Architects
National Institute of Inventors
Periodical Publishers Association of America
American Association of Foreign Language Newspapers
National Association of the Motion Picture Industry
Associated Motion Picture Advertisers
National Association of Music Merchants
Music Industries Chamber of Commerce of the United States of America
National Scale Men's Association
National Consumers League
National Consumers Co-operative Association
National Federation of Federal Employees
Commercial Union of America
National Association of Clothiers
American Wholesale Garment Association

National Shoe Wholesalers Association of the United States
Millinery Chamber of Commerce of the United States
Millinery Jobbers Association
National Jewelers' Board of Trade
American Woods Export Association
American Wood Preservers Association
National Association of American Wood Pulp Importers
American Metric Association
American National Conference on Weights and Measures
Common Commercial Language Committee
United States Section, International High Commission
Franco-American Board of Commerce and Industry
Alliance Francaise
National Federation of French Alliances
Norwegian American Chamber of Commerce
Swedish Chamber of Commerce of U. S. America
Holland American Chamber of Commerce
American Society of Equity (Agricultural)
National Efficiency Society
American Society for Testing Materials
Railroad Yardmasters of America
American Warehousemen's Association
Agassiz Association (National scientific organization)
Association of Amateur Scientists
American Association of Anatomists
American Entomological Association
Mathematical Association of America
American Numismatic Society
American Genetic Association
American Physical Society
American Federation of Human Rights
American National Food and Dairy Association
National Conference of Food, Dairy and Drug Officials
National Wholesale Druggists Association
National Association of Retail Druggists
American Pharmaceutical Association
National Pharmaceutical Service Association
National Drug Trade Conference
American Drug Manufacturers Association
National Association of Drug Clerks
American Nurses Association
American Medical Trade Association
American Surgical Trade Association

American Academy of Medicine
American Medical Association
American Association of Pathologists and Bacteriologists
American Optometric Association
Independent Order of Foresters
Knights of the Golden Eagle
Modern Brotherhood of America
United Commercial Travelers of America
Travelers' Protective Association of America
National Congress of Mothers and Parent-Teachers Association (250,000 members)
National Child Welfare Association
National Kindergarten Association
National Women Lawyers Association
War Mothers of America
National Council of Catholic Women
National Catholic Welfare Council
Rainbow Division Veterans
National Association of Naval Veterans
Electrical Manufacturers Export Association
American Institute of Electrical Engineers
National Association of Electrical Contractors and Dealers
Institute of Radio Engineers
American Institute of Chemical Engineers
Institute of Makers of Explosives
American Association of Pharmaceutical Chemists
American Electrochemical Society
Society of Chemical Industry
American Chemical Society
Association of Official Agricultural Chemists
Association of American Agricultural Colleges and Experiment Stations
National Academy of Sciences
American Association for the Advancement of Science

It should be noted that these NATIONAL organizations are often made up of many local and State organizations, who are thus united in advocacy of the world metric standards. The organizations here named are speaking officially in behalf of their several million members.

In this place, it is appropriate to instance some of the great world organizations which have participated in the movement which is rapidly bringing all the world onto the metric basis.

WORLD ORGANIZATIONS AMONG THOSE URGING GRADUAL METRIC STANDARDIZATION OF WEIGHTS AND MEASURES

League of Nations
International Red Cross
Pan-American Financial Conference
Pan-American Federation of Labor
Pan-American Commercial Conference
Pan-American Scientific Congress
Inter-American High Commission
Customs Congress of the American Republics
International Postal Congress
International Electrical Congress
International Institute of Agriculture
International Brotherhood of Electrical Workers
International Metallurgical and Chemical Society
International Geneva Society of Hotel and Restaurant Employees
Inter-Allied Scientific Food Commission
Inter-Racial Council
International Correspondence Schools
International Map Committee
Babson's World Statistical Organization
World Bureau of Weights and Measures
World Metric Standardization Council
World's Sunday School Association
International Esperanto Association
International 100% Club (United States of America and Canada)
Northern White Cedar Association (United States of America and Canada)
International Association for Exports

—and hundreds more. Also American Chambers of Commerce in Belgium, Italy, Spain, France, Germany, Brazil, Argentina, Mexico, Philippines, Turkey and many other countries.

For British, Canadian, South African and Australasian organizations urging world metric standardization see Chapter 11 of this volume: "Metric Movement Thruout Britannia."

From the thousands of letters and resolutions from organizations, it is appropriate to quote here a few. More cannot be given, because of lack of space. But it is important to know that great associations, both national and international in scope, and

with hundreds and thousands of members, are working together for world unity of weights and measures, upon the metric basis:

National Research Council, thru Vernon Kellogg, Permanent Secretary, Washington, D. C.: "At the meeting of the Executive Board of the National Research Council held on 13 December, 1921, the following motion was adopted and spread on the minutes: 'Moved, That the National Research Council is in favor of the extension by law of the use of the metric system in commercial transactions in the United States. Adopted.'" (The National Research Council was established in 1916 under Congressional Charter, and organized with the co-operation of the National Scientific and Technical Societies of the United States of America.)

National Association of Electrical Contractors and Dealers, thru W. H. Morton, General Manager, New York City (24 January, 1921): After discussion the following resolution was adopted, "That the National Executive Committee favors the enactment of Legislation which will bring in the use of Metric weights and measures in commercial transactions after a sufficient number of years."

Electrical Manufacturers' Export Association of the United States of America, Inc., Hudson Terminal Building, New York City, thru W. B. McCurdy, Secretary (3 June, 1919): "We are of the opinion that it is practical to make the change, and the good to be accomplished by such action will more than offset any expense or inconvenience which we may be put to. We are convinced that our weights and measures are a discredit to us, and we wish to eventually adopt the meter-liter-gram measurements."

National Association of the Motion Picture Industry, thru F. H. Elliott, Executive Secretary, New York City (3 November, 1920): The Executive Committee adopted this resolution unanimously: "Resolved, That the National Association of the Motion Picture Industry, Inc., in the interest of standardization, favors the enactment of legislation that will secure the advantages of the general use of metric weights and measures (International metric system) for the United States of America."

National Paper Box Manufacturers Association, thru William W. Baird, Secretary, Philadelphia, Pa.: "We have prepared an article for publication in our Monthly Bulletin favorable to the Metric System. We wish you all success in your endeavor." (Letter to the World Trade Club, 17 February, 1920.)

4-One Box Makers Association (National), thru Francis H. McKeever, Secretary-Manager, Conway Building, Chicago (16 April, 1921): "In regard to the adoption of the Metric System of

ALBERT HERBERT

W. H. HAMMER

© C. W. ELIOT

© WILLIAM C. REDFIELD

JOHN J. ARNOLD

© GEN. HUNTER LIGGETT

HOWARD RICHARDS

BURGESS DARROW

ROBERT E. SWAIN

CLANCEY M. LEWIS

LUTHER BURBANK

SIR FRANK POPHAM YOUNG

COLLABORATORS IN THE WORLD METRIC STANDARDIZATION COUNCIL

Eliot photo © by Underwood & Underwood; Liggett photo © by Hartsook; Redfield photo © by "International."

BEN C. DAILEY

C. E. HYDES

H. W. GLENSOR

JAMES G. DECATUR

E. G. BABBITT

WILLIAM E. HAGUE

G. I. KINNEY

JOHN H. GERRIE

ARTHUR R. BIRD

N. A. DAVIS

C. A. MAYDWELL

H. N. THOMAS

SOME PROMINENT MEMBERS OF THE WORLD TRADE CLUB
(FOREIGN TRADE CLUB OF SAN FRANCISCO)

Weights and Measures, the Board of Governors of this association is in favor of the proposed gradual standardization."

National Preservers and Fruit Products Association, Washington, D. C., thru R. U. Delapenha (26 December, 1919): "At the Annual Convention of the National Preservers and Fruit Products Association, held in St. Louis 19 and 20 December, resolutions were adopted and our secretary ordered to send messages to the President of the United States and to the Right Honorable Lloyd George, the British Premier, recommending the prompt adoption of the metric system." Marcus Blakemore, President of the National Preservers and Fruit Products Association, declared (27 October, 1919): "The necessity for the universal adoption of the Metric System seems unquestionable."

Salt Producers Association (National), by D. B. Doremus, Secretary, Detroit, Mich. (13 May, 1921): "At the last regular meeting of the Salt Producers Association the members (who have, by the way, for some years past had considerable interest in this question) read and discussed the metric Bill S4675 with the result that the motion to express the approval of the members was supported and **carried unanimously.**"

National American Association of Clothiers, thru Irving Crane, Secretary, New York City (17 November, 1919): "The Executive Committee of the National Association of Clothiers at its meeting held today endorsed the adoption of the metric system by the United States of America."

Manufacturing Perfumers' Association of the United States, thru C. M. Baker, Secretary, 309 Broadway, New York City: "The Manufacturing Perfumers' Association has cast its vote in favor of the adoption of the Metric System. The resolution adopted at the annual meeting of our Association held in New York, 12 May, 1921, is as follows: "**Whereas,** the metric system of weights and measures possesses many advantages over the system at present in use in the United States; and, **Whereas,** the larger part of the raw materials entering into the manufacture of perfumes and toilet preparations are weighed and measured by the metric system; and **Whereas,** there is now under consideration by the Congress of the United States a bill known as H. R. 10, introduced by the Honorable Fred Britten, which fixes the metric system of weights and measures as the single standard of weights and measures for certain uses; be it therefore **Resolved,** that the Manufacturing Perfumers' Association of the United States, in annual convention assembled, endorses and urges the passage of H. R. 10; and be it further **Resolved,** that a

copy of these resolutions be sent to the Committee on Coinage, Weights and Measures of the House of Representatives."

On the Executive Board of this association are representatives of such well-known national advertisers as Gilbert Colgate, Colgate & Co.; V. Vivadou, of V. Vivadou, Inc.; Felix Lowy, The Palmolive Co.; F. C. Adams, The Andrew Jergens Co.; C. M. Baker, Pond's Extract Co.; and others equally eminent in this field of manufacture.

American Surgical Trade Association, thru F. B. Hovey, Secretary, Chicago, Illinois (10 February, 1921): "The American Surgical Trade Association is in favor of the metric system of weights and measures, and heartily supports the measure now before Congress to provide for its general use in the United States. We are in favor of the United States going solidly upon the metric system, and as far as I know, the bill which has been presented is as effective a method of obtaining this result as any that could be devised."

American Medical Trade Association declares itself officially in favor of the metric movement, and has memorialized the American and British governments to adopt the Metric System of weights and measures. This is "a National Association of manufacturers, dealers and importers of surgical instruments, hospital and office furniture, hospital and nurses' supplies, electro-medical and X-Ray apparatus, orthopedic appliances and artificial limbs, laboratory equipment, surgical dressings and plaster, medical books, pharmaceutical and other allied lines."

American Association of Wholesale Opticians, thru G. A. Henry, Secretary-Manager, New York City (14 March, 1921): "The metric system is absolutely essential and universally in use, when it comes to the measuring of things opthalmic, and in the establishment of standards according to which optical lenses are gauged or measured. Years ago in the opthalmic field when simple lenses only were used and before the advent of cylinder and compound lenses, the simple lenses (i. e., spheres) were gauged according to focal length in inches. With the advent of compound lenses (i. e., spheres combined with cylinders) it was soon found that the old system of indicating lens strength was **cumbersome** and impracticable. The metric system was adopted for indicating the strengths of opthalmic lenses. The standard adopted was the meter."

Music Industries Chamber of Commerce of the United States of America, thru Alfred L. Smith, General Manager, New York City (2 February, 1921): "This Chamber of Commerce, at a meeting of its Directors, went on record in favor of the metric system,

but not in favor of any particular bill or methods whereby it should be brought about." This organization has the following Division Members: National Piano Manufacturers Association of America; National Association of Music Merchants; National Music Roll Manufacturers Association; National Musical Merchandise Association of the United States; Musical Supply Association of America; Music Publishers Association of the United States; Band Instrument Manufacturers Association; National Association of Talking Machine Jobbers; National Piano Travelers Association; National Association of Piano Tuners; Organ Builders Association of America. (It is interesting to note that James Watt, who worked out the metric plan and got it started into worldwide public use, built an **Organ** to order as well as the first steam-engine for worldwide use.)

National Shoe Wholesalers' Association, by Louis M. Taylor, Secretary-Treasurer (12 July, 1920): "At a meeting of the Executive Committee of this Association held in Boston on 8 July, I was designated to serve on the World Metric Standardization Council as an advisory representative of this Association." The national organization is composed of: Western Association of Shoe Wholesalers; Southern Shoe Wholesalers' Association; Middle States Shoe Wholesalers' Association; New England Shoe Wholesalers' Association.

National Association of Tanners (1 February, 1917): "Be it resolved that we the Board of Directors of the National Association of Tanners do hereby suggest to the Board of Directors of the Chamber of Commerce of the United States of America, that they place before the constituent members of said Chamber, in form of a Referendum, the question of the advisability of the adoption of the metric system as the only legal standard of weights and measures in the United States."

American Specialty Manufacturers' Association, in annual convention, New York City, 19 November, 1920: "Resolved, That we reaffirm our position previously taken favorable to the eventual adoption of the International Metric System of weights and measures in simplification of our present cumbersome system; and for the present recommend the double marking with the English weights and the Metric equivalents, as of value in goods for export, and as of value for its educational advantages." (A like resolution was adopted at the 1921 convention.)

American Pharmaceutical Association, thru William B. Day, General Secretary, Chicago (5 January, 1921): "The American Pharmaceutical Association has been for years and is today an ardent advocate of the use of the metric system."

National Association of Drug Clerks, thru P. A. Mandabach, Secretary and Treasurer: "The subject of the metric system is one upon which we have as early as 1910 adopted resolutions, asking organized pharmacy to take the initiative for universal international adoption." In annual convention, a strong resolution was passed, from which this is an excerpt: "**Whereas,** The metric system of weights and measures is superior to the cumbersome system now in use in the United States; and **Whereas,** The difficulties of transition from our system, or lack of system, to the metric system are largely imaginary; and, contrary to the prevailing idea, weights will not have to be replaced, but merely re-adjusted, the scale-beams re-marked, and measures either adjusted or converted to containers; and **Whereas,** This being a time of World reconstruction and a period of competition for leadership in science, industry, and the world's trade, it is essential that each branch of American activity be brought to the top-notch of efficiency; therefore be it **Resolved,** That the American National Association of Drug Clerks in annual convention assembled declares itself strongly in favor of immediate legislation to bring about the exclusive use of the metric system within the confines of the United States of America." (The full text of this excellent resolution is printed in World Trade Club booklet 4, "Who Urges Meter-Liter-Gram?," page 72.)

United States Sugar Manufacturers Association has in 1921 gone on record in favor of gradual metric standardization, as proposed in bills now before Congress. The President of this national organization, Henry H. Rolapp of Salt Lake City, Utah, has petitioned Congress to enact the Metric Standards Bill.

American Woods Export Association, thru Nelson C. Brown, Secretary, 30 Church Street, New York City (18 November, 1920): "This association has given its hearty support to the metric system of measurements, and we trust that it may be adopted very promptly in this country, as there is no question of its many advantages." This position was re-affirmed unanimously at a meeting of the association held at the rooms of the Up-Town Club, 21 East 45th Street, New York City, 5 February, 1921. Besides its offices in the United States, this international organization maintains headquarters in Belgium, France and Spain.

Association of American Steel Manufacturers, some years ago at a meeting held in Steelton, Pennsylvania, United States of America, adopted the following resolutions: "**Resolved,** That this association hereby endorses House of Representatives bill No. 7251, establishing the metric system of weights and measures, and

requests that the individual members of the association correspond with their Representatives and Senators urging its passage.

"The firms and corporations represented at the meeting were as follows: Jones & Laughlin, Pittsburg, Pa.; Carnegie Steel Company, Pittsburg, Pa.; Cambria Iron and Steel Company, Johnstown, Pa.; Bethlehem Iron Company, South Bethlehem, Pa.[1]; Central Iron Works, Harrisburg, Pa.; Pottstown Iron Company, Pottstown, Pa.; Illinois Steel Company, Chicago, Ill.; Carbon Steel Company, Pittsburg, Pa.; Park, Brother & Company, Pittsburg, Pa.; Lukens Iron and Steel Company, Coatesville, Pa.; Pennsylvania Steel Company, Steelton, Pa.; Colorado Fuel and Iron Company, Pueblo, Colorado."

Sewing Machine Manufacturers Association of the United States, in 1921, went on record in favor of gradual metric standardization of weights and measures, as proposed in the Britten-Ladd Bill now before Congress. Among the members of this Association are: Davis Sewing Machine Co., Dayton, Ohio; New Home Sewing Machine Co., Orange, Mass.; White Sewing Machine Co., Cleveland, Ohio; Standard Sewing Machine Co., Cleveland, Ohio; Free Sewing Machine Co., Rockford, Illinois; National Sewing Machine Co., Belvidere, Illinois.

National Foreign Trade Convention, group session, Pittsburg, Pa. (January, 1917): The following resolution was adopted: "That the use of the metric system be adopted more widely, and of course used exclusively in quotations for foreign sales (except in England and the colonies)."

Commercial Union of America, thru Geo. H. Baston, 23-25 Beaver Street, New York City (29 January, 1921): "We use the metric system quite extensively in our international trade, in quoting prices and so on. All prices on grain and flour to European countries are quoted in dollars and cents per 100 kilos. It is desirable to use this system, as it is understood in Europe, and we have not found any particular difficulties in its use." (See also favorable testimony of E. D. Horner, General Manager; U. S. Congress Metric System Hearings, 1921, page 166.)

American Society of Equity, Madison, Wisconsin (25 February, 1920): "We cover the states where the greatest quantity of **farm products** is produced and we are in favor of the Metric System. The adoption of the Metric System by the United States would greatly facilitate and reduce labor of computation and we believe it would be to the advantage of both instruction and practice." (This is an economic **agricultural** organization.)

[1] Charles M. Schwab is Chairman, Bethlehem Steel Corporation, 1922. The fact that Andrew Carnegie consistently urged world metric standardization is well known. (See Carnegie Committee Metric Report.)

National Consumers Co-operative Association, thru Rafael Mallen, Organization Department, Chicago, Illinois (24 May, 1920): "You may be sure that the National Consumers Co-operative Association is in favor of the Metric System. As a statistician, I have been unable many times to make a quick analysis of a situation because of the different systems of measures in the United States, Canada and Mexico. It is a shame that the United States and Britain should not have adopted the Metric System long ago." This organization is affiliated with the National Co-operative Association (Wholesale).

The Swedish Chamber of Commerce of the U. S. A., thru G. Sundelius, Secretary, Produce Exchange Building, New York City (14 December, 1920): "The Board of Directors is unanimous in going on record as favoring the Metric System, to attain world unity in weights and measures." Johan Riis, former Secretary of this organization, declared (26 April, 1920): "I believe that the installation of the metric system would be very beneficial to the United States."

American Association for the Advancement of Science: Several years ago the American Association for the Advancement of Science went on record favoring the general adoption of the metric system in the United States. This national association literally represents all of the scientific organizations of America; so that, in the words of the eminent metric advocate, Dr. H. V. Arny, Professor of Chemistry at Columbia University, **"Everybody Knows Where Science Stands."** Among the national organizations represented by the Council of the American Association for the Advancement of Science are:

American Physical Society
American Chemical Society
American Astronomical Society
Geological Society of America
Association of American Geographers
Seismological Society of America
Entomological Society of America
American Society of Zoologists
American Association of Economic Entomologists
American Society of Naturalists
Ecological Society of America
American Genetic Association
American Microscopical Society
Botanical Society of America
American Phytopathological Society

American Anthropological Association
American Institute of Electrical Engineers
American Institute of Mining and Metallurgical Engineers
American Society of Civil Engineers
American Society of Mechanical Engineers
Illuminating Engineering Society
American Medical Association
National Society for the Study of Education
American Federation of Teachers of the Mathematical and Natural Sciences
Society of College Teachers of Education
The Society of Sigma Xi
American Meteorological Society
Optical Society of America
Eugenics Research Association
American Psychological Association
American Association of Anatomists
Society of American Bacteriologists
Society of American Foresters
American Society for Horticultural Science
Southern Education Society

Among the Associated Societies of the American Association for the Advancement of Science are: The American Mathematical Society, Mathematical Association of America, American Electrochemical Society, American Institute of Chemical Engineers, Paleontological Society of America, American Alpine Club, National Council of Geography Teachers, The Wilson Ornithological Club, American Nature-Study Society, The Botanists of the Central States, American Folk Lore Society, Archaeological Institute of America, American Association for Labor Legislation, American Civic Association, American Economic Association, American Metric Association, American Sociological Society, American Statistical Association, Society for the Promotion of Engineering Education, American Society of Heating and Ventilating Engineers, American Society of Refrigerating Engineers, American Physiological Society, American Society of Biological Chemists, American Society for Pharmacology and Experimental Therapeutics, American Academy of Medicine, American Association of Neuro-Pathologists, American Public Health Association, American Society for Experimental Pathology, Society for Promotion of Agricultural Science, American Society of Agronomy, American Dairy Science Association, American Pomological Society, American Society of Animal Production, Associa-

tion of Official Seed Analysts, The School Garden Association of America, American Association of University Professors, American Philosophical Association, Bibliographical Society of America, and many other scientific organizations, besides 15,000 individual members. Among the prime objects of the American Association for the Advancement of Science are "to facilitate research, the publication and dissemination of the results of research, **and the prompt application of these results in daily life.**" The Association has consistently urged metric standardization of weights and measures, and its official weekly journal, "Science," has published many excellent articles on this subject.

American Academy of Medicine, at its meeting held at Atlantic City, 9 and 10 June, 1919, adopted the following: "The American Academy of Medicine recommends that the Units of the Metric System be adopted by the Congress of the United States and the British Parliament as the exclusive legal standards of weights and measures, and that the Secretary of the Academy is instructed to bring this Minute to the attention of the President of the United States and the British Premier."

American Medical Association (82,000 members) has long been on record in favor of metric standardization. Typical of its position is the following resolution, adopted unanimously in annual convention: "Resolved, (1) That the American Medical Association adopts the International Metric System, and will use it in its transactions; (2) Requests that those who present papers at its future meetings employ this system in their communications, or reprints thereof; (3) Requests the medical boards of hospitals and dispensaries to adopt the Metric System in prescribing and recording cases; and that the faculties of the medical and pharmaceutical schools adopt it in their didactic, clinical or dispensing departments; (4) Requests the physicians familiar with the Metric System to help their *confreres* and the druggists in its application; and the delegates present at this session to work up the acceptance of the Metric System by their respective County and State societies; (5) Requests our President to name a Metric Executive Committee, of which he shall be the ex-officio Chairman, and whose task will be to give unity and rapidity to this Metric movement."

American Association of Pathologists and Bacteriologists, thru Howard T. Karsner, Secretary: At a meeting of the Association held in New York City, 2 April, 1920, it was "voted that the American Association of Pathologists and Bacteriologists endorse the adoption by the United States of America of the metric

system of weights and measures." The organization has petitioned Congress to enact Metric Standards legislation.

American Nurses' Association, thru Katherine DeWitt, Secretary, Rochester, N. Y. (2 July, 1919): "The Board of Directors of the American Nurses' Association has instructed me to express its approval of the universal use of the metric system."

American Physical Society, at a meeting held in New York City, 26 February, 1921, passed this resolution: "We urge the adoption of the decimal metric standards of weights and measures in the United States."

The Agassiz Association (a National scientific organization), thru Edward F. Bigelow, President, Arcadia, Sound Beach, Connecticut: "We are heartily in favor of the adoption of the metric or decimal basis of measurement, weight, and so on. We surely shall welcome the time when that system shall be used thruout the world. I am wondering why business men and mechanics have been so slow in recognizing its superior advantages."

Association of Amateur Scientists, thru S. L. Shields, Secretary, Brooklyn, New York (22 March, 1920): "Allow me, in the name of the Association of Amateur Scientists, to emphasize the urgent need of a Meter-Liter-Gram system. It will greatly facilitate scientific work. Above all, it will bring the scientific ideas of the day more into the life of the community."

American Society for Testing Materials, by the Executive Committee, Philadelphia, Pa. (16 February, 1920): "The Society will begin to publish measurements in the present system with the metric equivalent immediately following in parentheses, except where the metric units are the universally accepted standards, in which case it is to be optional with the Committee as to whether the present equivalent shall be given."

At the metric discussion held 7 November, 1919, by the **American Philosophical Society** at their headquarters on Independence Square in Philadelphia, Hon. William C. Redfield, formerly United States Secretary of Commerce, presented a paper entitled, "An International Treaty which Resulted in a Scientific League of Nations." The paper gave a historical account of the metric treaty of 20 May, 1875, which resulted in the establishment of the International Committee on Weights and Measures, the International Bureau of Weights and Measures, and provided for the construction of the international standards of length, capacity, and weight. Mr. Redfield also discussed the scientific significance of the establishment of the International Bureau of Weights and Measures which is now maintained by the leading nations of the world (including the United States of America and Britannia) at

[illegible] Park) Paris, France—on
[illegible] was with great care prepared
[illegible] which are held by the various
[illegible] compared with the original

[illegible] Agricultural Chemists (26 October,
[illegible] endorses the proposal now
[illegible] after due notice, the metric
[illegible] made the legal system of the
[illegible] the introduction of this sys-
[illegible] in the purchase of supplies,
[illegible] terms of the metric system so

[illegible] Chemical Engineers, thru David Wes-
[illegible] New York City: "I wish to give
[illegible] Institute of Chemical Engineers is
[illegible] Standardization."

[illegible] Society, thru its Secretary, Joseph
[illegible] in Cleveland, Ohio, 1 October,
[illegible] vote on the adoption of the
[illegible] measures in this country (United
[illegible] 484 members favored this system

[illegible] Electrical Engineers has long been on
[illegible] general adoption of the metric system
[illegible] Some years ago the Standardization
[illegible] in favor of the metric system to
[illegible] who referred the resolutions to the mem-
[illegible] The final vote: 1569 in favor; 178
[illegible] present time, with the teachings of the
[illegible] entry of the United States into world
[illegible] would be even more decisive.) The
[illegible] as follows:

[illegible] system of weights and measures offers
[illegible] by its simplicity, consistency and conven-
[illegible] as well as in engineering and scientific
[illegible] computations, and

[illegible] advantages have already been demonstrated
[illegible] and entirely successful use of the metric
[illegible] countries except the United States and

[illegible] the elect[illegible] universal use, such as the
[illegible] watt, a[illegible] tric units, and

"**Whereas,** The industrial use of these electrical units would be facilitated by the general adoption of the metric system, therefore,

"**Resolved,** That this committee unanimously recommends the introduction of the metric system into general use in the United States at as early a date as possible, with no undue hardship to the industrial interests involved;

"**Resolved,** That this committee favors such legislation by Congress as shall secure the adoption of the metric system by each department of the national government as speedily as may be consistent with the public welfare."

Institute of Radio Engineers, thru Alfred N. Goldsmith, Secretary, New York City: "At its meeting of 19 November, 1920, the Board of Direction of the Institute of Radio Engineers adopted the following resolution: **Whereas,** The advantages of the metric system of measurement have been clearly demonstrated by its extensive use in radio engineering, therefore be it

"**Resolved,** That the Board of Direction of the Institute of Radio Engineers favors the enactment of legislation by the United States Congress whereby the present system of weights and measures will be replaced by the metric system."

National Institute of Inventors, thru Paul R. Fay, Executive Secretary, New York City (31 March, 1921): "The National Institute of Inventors is in favor of the metric system, and approves of the Metric Standards bill now under consideration by the United States Congress. We are requesting members of the National Institute of Inventors in every State of the Union to write their national legislators urging the passage of this bill." This organization of several thousand members is giving its whole-hearted support to the cause of metric standardization, and holds membership in the World Trade Club and in the World Metric Standardization Council. It is also a member of the American Mining Congress, Associated Advertising Clubs of the World, Industrial Arts Council and the Patent Office Society.

American Institute of Architects, thru E. C. Kempes, Secretary, Washington, D. C. (12 September, 1919): "By direction of the Executive Committee, I am writing to advise that the American Institute of Architects for many years has been in favor of the adoption of the Metric System, and has so expressed itself to the public and its membership on various occasions."

Railroad Yardmasters of America, Columbus, Ohio (19 April, 1920): "We have requested the British government, as well as the Bureau of Weights and Measures of the United States, to adopt the metric system; and we are willing to co-operate along

those lines. We are making reference to this matter in our monthly publication."

American Railway Bridge and Building Association, thru C. A. Lichty, Secretary, Chicago, "endorses legislation that will bring about the exclusive use of Meter-Liter-Gram by the United States of America."

American Federation of Labor, thru Committee, at the 39th Annual Convention, Atlantic City, N. J. (9-23 June, 1919): "In view of the demonstration by war conditions of the industrial and educational value of the metric system, the committee recommends that the Executive Council cause an investigation to be made of the advantages of the introduction of the metric system into this country with a view to determine what further steps, such as Congressional action, may be advisable."

After looking into the subject of metric standardization, the executive head of the American Federation of Labor, Samuel Gompers, came out unqualifiedly in favor of general adoption of the metric units and expressed his desire to aid in any way possible to bring about this result. (His statement is given elsewhere. See also statement in this Chapter, by Canuto Vargas, in behalf of the Pan-American Federation of Labor.)

National Federation of Federal Employees, at its New Orleans convention, 1921, passed this resolution: "**Whereas,** The present system of weights and measures in use in the United States is cumbersome, and not in complete harmony with any other nation of the world; and **Whereas,** The present weights and measures are a source of constant nuisance, costly errors, loss of time, loss of effort, and a formidable obstacle to greater national efficiency and international co-operation; and **Whereas,** The international metric system is the simplest system of weights and measures ever devised, and has already been adopted in more than 34 countries of the world; now, therefore, be it **Resolved,** That the National Federation of Federal Employees, in convention assembled, recommends the early passage of the Britten-Ladd Bill—H. R. 10 and S. 2267—to secure for the people of the United States the advantages of the commercial use of the international metric system after a liberal period of 10 years."

International Brotherhood of Electrical Workers, with a membership of 180,000, at its annual convention in St. Louis, Missouri, 29 September, 1921, passed this resolution by a large vote: "**Resolved,** That the International Brotherhood of Electrical Workers in Convention assembled recommends the enactment of legislation that will secure the advantages of the general use of metric weights and measures for the people of the United States,

and that we also endorse H. R. 10 and S. 2267, a bill calling for the commercial use of the metric system by the people of the United States after a transition period of 10 years."

National Catholic Welfare Council, thru Rev. John J. Burke, C. S. P., General Secretary, Washington, D. C.: "In connection with proposed legislation covering gradual introduction of metric system: the general idea contained in the proposed legislation seems to the officers of this Council to be desirable." (Most Rev. Edward J. Hanna, D. D., San Francisco, is Chairman of the National Catholic Welfare Council.)

National Council of Catholic Women, of the National Catholic Welfare Council, thru Agnes G. Regan, Executive Secretary, Washington, D. C. (15 March, 1921): "In regard to the Metric Standards Bill now before Congress, the attitude of the National Catholic Welfare Council is favorable toward such legislation."

National Child Welfare Association, thru Charles F. Powlison, General Secretary, Educational Building, New York City (14 February, 1921): "It was resolved that the Board of Directors of the National Child Welfare Association, Inc., recommend the use of the Metric System in the interest of future generations in order to make uniform the use of weights and measures." (Judge William H. Wadhams, New York City, is President, and Herbert Hoover, Washington, D. C., is Vice-President of the National Child Welfare Association.)

War Mothers of America, National Executive Headquarters, Evansville, Ind.; by Beatrice Hillham, Corresponding Secretary, 4 March, 1919: "Mrs. Morris asks me to say that as President of the War Mothers of America she heartily endorses a movement to bring about the Meter-Liter-Gram system of weights and measures in the United States. Such a movement would not only render mercantile transactions more simple, but would be another great step forward toward smooth international relations."

Many statements strongly urging metric standardization have been issued by executive officers of important national organizations; and in almost all cases these executives represent accurately the sentiment of the organizations as a whole. From among the hundreds of such statements which have been issued, a typical selection may be presented:

F. C. Backus, Secretary, **National Jewelers Board of Trade** (25 October, 1919): "Relative to the adoption of the metric system in the United States, I would state that **The Jewelers' Vigilance Committee,** representing the jewelry trade, of which Mr. Harry C.

Larter, 23 Maiden Lane, New York City, is Chairman, has been interested in this subject for the past year, endorsing the same; and I understand that the Committee will soon have a report to make to the trade, approving the use of the metric system."

M. Wulpi, Commissioner, **Central Bureau of Extension Dining Table Manufacturers,** Chicago, Illinois (4 February, 1920): "The writer has read with interest matter received from the World Trade Club and favors your effort, commending you in it." (Letter to the World Trade Club.)

D. D. Fennell, Executive Secretary, **National Association of Upholstered Furniture Manufacturers,** Chicago, Illinois (19 March, 1921): "The writer, being an engineer, is completely committed to the Metric Standardization plan."

North Storms, Secretary-Treasurer, **National Glass Distributors Association,** Chicago, Illinois (24 March, 1921): "Personally I believe we should change to the metric system but could, of course, not speak officially for the Association until it had expressed itself formally." The predecessor of Mr. Storms as Secretary-Treasurer, J. Roy Helm, wrote (17 October, 1919): "Many members of the National Glass Distributors' Association have displayed, since the end of the War, with a resultant expansion in their export business, an increasing interest in the Metric System."

M. E. Holmes, Manager Chemical Department, **National Lime Association** (18 January, 1921): "I am firmly in sympathy with the plans of the World Metric Standardization Council and hope they go thru."

Morris G. White, Jr., Manager Foreign Trade Division, **National Federation of Construction Industries,** Philadelphia, Pa. (3 March, 1920): "In view of a recent experience, we are more than ever in favor of the adoption of the metric system."

Frederick Bode, President, **Millinery Chamber of Commerce of the United States of America** (24 October, 1919): "I am, personally, decidedly in favor of the metric system. It has great advantages over our present system. There is no doubt in my mind that it would be of great advantage to the United States to adopt the metric system, especially as we are bound to wish to do export trade in countries in which the metric system is used."

Fred C. Taylor, Secretary, **Millinery Jobbers Association** (National), Chicago, Illinois (9 February, 1921): "I am writing Congressman Britten, telling him what I think of the Metric System. Having lived 2 years in South America, I can appreciate its merits. . . . I spent almost 2 years in the wilds of the Amazonian jungles, during the construction of the Madria-Mamore Railway, in which connection I had much to do with weights and

measures, as I had charge of several of the largest of the Company's commissaries, and I wish to state that all of the bulk supplies, such as sugar, coffee, tea, and so on, were sold under the Metric System.

"Those who claim that the Metric System is not used in South America are making statements which they cannot substantiate. Even up in the jungles the natives are familiar only with kilos, and all of the vast rubber business formerly done in that territory was measured by Metric standards. Latin America long ago standardized her weights and measures to conform to Metric units, and if some of these people who claim that this is not so would make a trip to such countries as Brazil, Argentina, Chile, and so on, they would very soon change their ideas.

"I trust that the Metric standards may soon be adopted in the United States of America, as they are far superior to any other weight-measure system and are the only logical measurements."

Caswell A. Mayo, Vice-President, **National Pharmaceutical Service Association** (15 April, 1920): "Both President Frank B. Cain of the National Pharmaceutical Service Association and myself are personally in favor of the adoption of the metric system."

Phil. Weiss, Secretary, **American Registered Pharmacists,** expresses (26 May, 1920) the support of that organization to secure the adoption of the metric system of weights and measures for the United States.

W. A. Gravett, Secretary, **American Osteopathic Association,** Dayton, Ohio (2 March, 1921): "Personally I favor the Metric Standards Bill."

E. L. Fisk, Medical Director, **Life Extension Institute,** New York City, N. Y.: "I am strongly in favor of metric units." (The President of this organization is Hon. William Howard Taft.)

Frank J. Osborne, Executive Secretary, **American Society for the Control of Cancer,** New York City, N. Y. (4 March, 1921): "I feel that the effort of the World Metric Standardization Council should be supported, both on the grounds of uniformity with standards used by other civilized countries, and because of the scientific accuracy of the metric system. The gradual standardization such as contemplated in the Metric Standards Bill should in the course of 10 years make it easily possible for the country to adopt the new standards without any serious difficulty."

William C. Groeniger, President, **American Society of Sanitary Engineering,** Columbus, Ohio (16 March, 1920): "Our Society is very much interested in the standardization of weights and measures. For years we have been hammering away upon the importance and necessity of standardization in plumbing and plumbing

material. . . . Having been privileged to visit South Africa, Portuguese East Africa, India, Egypt, Palestine, Syria, Italy and France during the World War, I appreciate the necessity of world standardization of weights and measures thru the adoption of metric units." (William C. Groeniger is one of the Directors of the National Bureau of Standardization of plumbing materials.)

R. C. Bailey, Manager, Department of Chapter Activities, **American Association of Engineers**: "The National Board of Directors of the American Association of Engineers, after considering this matter, recommended the subject of the adoption of the Metric System in the United States as a proper one for the discussions of A. A. E. Chapters. We have become actively interested in the extension of the metric system and its adoption as a standard in this country. As I look at it, the greatest saving in the exclusive use of the metric system is in engineering, and secondarily the saving in the time of educating, or the time required to gain an education." C. E. Drayer, Secretary of the American Association of Engineers, states: "The National Executive Committee believes that the metric system is a question of such moment as to merit the active consideration of our members." (This great organization has more than 30,000 members, and a number of its Chapters have gone on record in favor of gradual metric standardization. Its "Engineers' Directory" declares: "The American Association of Engineers is an organization of the same type as the United States Chamber of Commerce, or as the American Medical Society, American Institute of Architects, Bar, or other professional organization. A. A. E. has been characterized as *the Engineers' Chamber of Commerce.* It expects to attain its economic ends by the application of intelligence, by a united front, and publicity.")

W. G. Calderwood, **Bureau of Tax Research,** Minneapolis, Minn. (23 July, 1919): "Our clumsy and awkward conglomeration of weights and measures is not only difficult to learn but is inaccurate and confusing in its details. These lead to constant error and continuous fraud. I am exceedingly anxious to see them go."

Franklin D'Olier, 1st National Commander, **American Legion**: "I quite agree as to the merits of the metric system."

Edward P. Foster, Secretary, **Universal Language Society,** Marietta, Ohio: "Our present system of weights and measures, if it can properly be called a 'system,' is a medley—burdensome to the learner and the user, promotive of misunderstanding, prodigal in its waste of time, and antagonistic to the extension of trade and commerce thruout the world. I am glad to be associated with those who are working for the adoption of meter-liter-gram: that is, the

scientific, common sense system." (J. V. McMillan, Dean of Marietta College, is President of the Universal Language Society; W. V. Dick, President of the Safe-Cabinet Co. is its Vice-President.)

Louis D. Froelick, of the **American Asiatic Association** (26 March, 1920): "Thank you for sending copies of your publications on the metric system. Your work is certainly comprehensive and well directed, and will undoubtedly bring results." (Letter to the World Trade Club.)

Erving Winslow, Secretary, **The Anti-Imperialist League**: "I am strongly favorable to the metric plan."

Albert Shiels, Vice-President, **Inter-Racial Council**; and Chairman, Executive Board, **National American Council** (25 July, 1921): "I know that I am reflecting the opinion of many members of these organizations when I state that the adoption of the metric standards bills would be to the benefit of our country and injurious to no American interest. Those who are of this opinion are impressed by the importance of the adoption of the Metric System when made in the manner suggested by the legislation referred to, as it will not discommode the manufacturing industries. My personal experience as one of the Superintendents in the school system of New York City and as City Superintendent of the public schools of Los Angeles, California, has convinced me that the adoption of the Metric System would be of inestimable value in 2 respects: From the standpoint of instruction it would so completely simplify the arithmetical teaching in our public schools as to permit time for instruction in other subjects pressing for attention. From the standpoint of business it would introduce a universal and simple standard of measurement that would promote the sale of our own products thruout the world. The English-speaking people would have a common basis of measurement; and we should reap the advantage of new markets now controlled by nations that enjoy a partial monopoly of South American trade because they use the measurements of their prospective customers."

George Haven Putnam, President, **Free Trade League**: "I am personally fully in accord with the purpose of large-minded citizens thruout the world, to bring about the establishment of the metric system. I believe that such standardization of weights and measures, with which may properly be included a standardization of the world's currency, must advance the understanding of commercial relations and tend to further the Freedom of Trade." (Mr. Putnam has also endorsed the metric standards as President of the **American Rights League.**)

Louise Stevens Bryant, Educational Secretary, National Headquarters, **Girl Scouts** (18 May, 1920): "As a member of the American Statistical Association, I am very glad indeed to have opportunity to endorse the campaign for Meter-Liter-Gram, and hope that the metric bill will pass in Congress."

Mollie Price Cook, Secretary, **Child Conservation League of America**: "I have taken pleasure in giving meter-liter-gram editorial mention in the May, 1920, number of 'Social Progress.'" (Winfield Scott Hall, President of the Child Conservation League of America, is a member of the advisory committee of the World Metric Standardization Council.)

Eric Schuler, Secretary, **Authors' League of America** (15 February, 1921): "Personally I am very strongly in favor of the Metric system thruout the world, and I believe that a number of the members of our Executive Committee take the same stand."

William O. Stillman, President, **American Humane Association** (28 April, 1920): "I favor whatever action will be necessary to bring about the exclusive use of Meter-Liter-Gram by the United States."

D. P. Mackey, Supreme Commander, **The Maccabees**; Detroit, Michigan (24 February, 1921): "I favor the gradual adoption of the metric standards in the United States, during a transition period of 10 years."

Arthur H. Blanchard, President, **American Road Builders' Association,** New York City (2 May, 1919): "For many years I have heartily approved and strongly advocated the international standardization of weights and the adoption of the metric system."

Samuel Gompers, President, **American Federation of Labor** (12 June, 1919): "I firmly believe and long have believed that the metric system offers a return to simplicity, offers an effectiveness of thought, offers much even to children in our schools which we are not justified in withholding from them. The metric system is winning its way entirely on its merits just as it should because it is easy to learn, to work with, and best suited for practical purposes."

John Wilkinson, President, **United Mine Workers of America,** District 21, Ft. Worth, Texas (27 August, 1919): "I believe that the proposal of the World Trade Club of San Francisco is entirely logical, and should be put in operation by all nations. *While in Great Britain, Lloyd George and I repeatedly discussed the Meter-Liter-Gram system.* This was about 10 or 11 years ago. We discussed it then *in the interest of the trade* in the British Colonies and with uncivilized nations, and we realized that the natives could more easily comprehend a Metric System than that system in vogue

in Great Britain and that it did place Great Britain at a disadvantage with France and other nations who did employ the Metric System. However the proposed change met a good deal of opposition owing to the fact that the money in Great Britain was largely metal currency and in fact very little paper money was used at that time; but since then, and during the period of the War, especially, Great Britain has resorted to paper currency to a much greater extent than was employed prior to the War, and I believe that the change to the Meter-Liter-Gram System would be viewed with more favor, especially as a reconstruction measure, than it was viewed at the time I have mentioned."

C. S. Warner, Secretary, **Brotherhood of Railroad Trainmen,** Ogden, Utah (6 June, 1919): "I know of the advantages of the Metric System and have always regretted that it was not adopted in this country long ago."

A. Persion, General Secretary-Treasurer, **International Hod Carriers' Building and Common Laborers' Union of America,** Quincy, Mass. (20 October, 1919): "I personally and officially concur in the campaign to have the meter-liter-gram system adopted in these United States and in the British Isles, being acquainted with both the metric system and the local system of measuring. Any practical mind will realize that to make calculations with the unit of measures now in use in this country and in Britannia requires an extra amount of work as compared with the simplicity of the metric system.

"Only a few days ago I ordered from our jeweler a gross of our society emblems and on receiving the shipment, we then counted 120 buttons, but we received a bill for a full gross. Making complaint to the manufacturer, he traced the error to his shipping clerk, who being also a graduate of High School had in mind that a gross was 10 dozen. Indeed, I don't blame the young student! In his mind he had an advanced idea of the metric system."

Thousands of Organizations Urge Metric Standards

There has already been presented in this chapter a survey of the overwhelming sentiment in favor of metric standards among important national organizations thruout the United States. Scarcely a national business association exists which has not interested itself in this subject. Besides the hundreds of national associations, there are literally thousands of other organizations which urge the metric advance—inter-state, state, county, city and local. It would be impossible to review the published opinions of these societies within the scope of several volumes; but most of them have placed their statements in favor of metric standards on record at Washington,

D. C., where they are available to our national legislators. Here we can merely present a few typical statements, and give the names of some of the thousands of organizations which are working for meter-liter-gram in the United States of America.

Western Association of Electrical Inspectors, thru William S. Boyd, Secretary, Chicago, Illinois: "This organization endorses legislation that will bring about the exclusive use of the meter-liter-gram system of weights and measures by the United States of America, and by the British Isles. This Association has witnessed the good effect of the adoption of the Watt as the basis of power, enabling the rating of electric apparatus in kilowatts."

Connecticut Hardware Association (11 February, 1920), by resolution: "As the metric system is very simple in its operation, when once established, we would endorse its use in the United States of America as soon as it could be arranged."

California Retail Hardware and Implement Association, thru J. Glenn Marks, Secretary-Treasurer, Los Angeles, California (3 July, 1919): "Bully for the idea. Count us strongly in favor of the universal adoption of this standardization. It is one great step forward in our commercial world, and now is the time to replace our obsolete methods of measurement with a practical system."

Washington State Manufacturers' Association, Seattle, Washington (6 November, 1919):

"REFERENDUM: Upon the authorization of the Board of Trustees, on June 25th, a referendum was taken of our membership in which the manufacturers were asked to express themselves for or against the adoption of a metric system of weights and measures. RESULTS: Substantial returns were made by the manufacturers showing them to be 2 to 1 in favor of the adoption of the metric system. PUBLICITY: The results of this referendum were canvassed by the Board of Trustees and the secretary was instructed to advise the organizations at interest of the results. REPLIES: Since sending out our letter over the country, we have had a large number of favorable replies from various manufacturers and commercial organizations. By far the larger majority of these have either taken favorable action or are contemplating doing so. The last publication of the official organ, the 'Seattle Spirit,' of the Seattle Chamber of Commerce indicates favorable action by this organization."

The Secretary of the Washington State Manufacturers' Association, Clancey M. Lewis, declared (29 April, 1920): "It does not occur to me that the metric standardization needs any argument. It is one of those axiomatic premises upon which all subsequent commercial relations are dependent." (See also Chapter 7 for his

address before the World Metric Standardization Conference, 17 May, 1920.)

Nebraska Manufacturers' Association, Lincoln, Nebraska, thru Frank I. Ringer, Commissioner (6 November, 1919): "At a recent meeting of our Board of Directors the meter-liter-gram was endorsed." (Metric petition sent to Congress.)

New York State Wholesale Grocers' Association, in convention in New York City, 1920: "*Whereas,* it is to be hoped that the promotion of closer relations among the nations is to be one of the beneficent results of peace; and *Whereas,* we recognize the disadvantages of our present cumbersome tables of weights and measures; therefore, be it *Resolved,* that we urge manufacturers and our members to indicate on all labels the metric equivalents, in addition to the English weights and measures; and we commend our Metric System Committee for its excellent educational campaign, and we request it to continue the good work." (This association consists of 126 of the largest wholesale grocery firms in the State of New York, doing a volume of business amounting to over $300,000,000 a year, and employing over 58,000 people; it has passed unanimous metric resolutions at its last 8 conventions.)

Southern California Retail Lumber Dealers Association has petitioned the President of the United States of America, and the British Premier, to use their offices in bringing about world metric standardization. F. L. Morgan, Secretary-Treasurer, Los Angeles, California, writes (22 April, 1919): "Almost any way that would bring about a change would be welcome."

Northern White Cedar Association, thru N. E. Baucher, Secretary (13 May, 1919): "The Northern White Cedar Association is a voluntary organization of firms engaged in the production and sale of Northern White Cedar and other allied forest products. Its membership comprises 40 firms located thruout the States of Minnesota, Wisconsin, Michigan and Ontario. It is the firm belief of our governing board that the universal adoption of the metric system will prove beneficial to American and Canadian business, and we hereby endorse legislation that will bring about the exclusive use of the meter, liter and gram by the British Commonwealths as well as by the United States of America."

Ohio Grand Council, United Commercial Travelers of America, in convention at Youngstown, Ohio (14 June, 1919) unanimously adopted resolutions urging meter-liter-gram, "and that the President of the United States and the British Premier be respectfully requested to use their efforts to bring about the exclusive use of the meter-liter-gram system by the United States and Great Britain."

Upper Peninsula Development Bureau, Michigan (2 June, 1919): "The Upper Peninsula Development Bureau of the State of Michigan is heartily in favor of the adoption by Great Britain and America of the metric system of weights and measures."

Home Industry League of California, San Francisco, California (1 December, 1919): "The Home Industry League by resolution at the monthly meeting of the Board of Directors indorsed the metric system of weights and measures." (Now incorporated in the California Industries Association.)

Texas Midcoast Industrial Congress, Collegeport, Texas, thru H. A. Clapp, Secretary (8 February, 1920): "Our membership is almost to a man in favor of metric standardization. You do not need to put up any argument to me as to the value of the metric system, for I lived in Mexico 10 years and used it." (This association comprises industrial interests in 12 coast counties of Texas.)

Ohio Master Painters and Decorators at their convention in Cedar Point, 1920, adopted resolutions endorsing the adoption of the metric system of measurement in their business.

Maryland State Beekeepers' Association: "Resolved, that the Maryland State Beekeepers' Association is heartily in favor of the universal adoption of the Metric system as the world standard of measurement."

Illinois Chapter of the American Institute of Architects, thru Henry K. Holsman, Secretary, Chicago, Illinois: "I am much in favor of legislation that will bring about the exclusive use of the meter-liter-gram by the United States of America.

"Judging from many discussions during the past year, I may say that I believe that our profession would almost unanimously welcome such a change from the present system of weights and measures. It would be a very great savior of labor and an efficient eliminator of many errors and their wasteful consequences in the work of our profession."

New York State Nurses' Association, thru Julia A. Littlefield, R. N., Albany, New York (18 November, 1919): "The members of the New York State Nurses' Association at their recent meeting held in Brooklyn, New York, endorsed the recommendation of the World Trade Club to standardize the weights and measures of the world by adopting meter-liter-gram."

Iowa State Medical Society, in convention at Des Moines (14 May, 1920): "Resolved, that the Iowa State Medical Society urge that thru legislation or promulgation the units of the metric system of weights and measures be made the exclusive legal standards within the jurisdiction of the United States of America."

Pennsylvania Pharmaceutical Association (28 October, 1920): "Resolved, that we emphatically approve the universal adoption of the metric system for all commercial transactions at as early a date as is practicable." Louis Saalbach, Secretary, Pittsburgh, Pa., writes: "We have repeatedly taken this stand at our annual meetings, and we sincerely hope that the continued active work in its behalf will speedily bring about the adoption of the only logical system of weights and measures ever conceived by the ingenuity of humankind."

New Orleans Association of Commerce, New Orleans, Louisiana, thru A. E. Pradillo, Secretary, Foreign Trade Bureau (19 December, 1921): "The Foreign Trade Bureau has for several months endeavored to obtain an expression from its members regarding their attitude towards the adoption in this country of the metric system as the single standard for weights and measures. A special committee was appointed to make a thoro study of the subject and make recommendations. At a meeting of our Metric System Committee held 5 July, it was decided that it would be to the advantage and benefit of our Foreign Trade interests to have the exclusive use of the metric system as provided in a bill introduced in the House of Representatives, 67th Congress, H. R. 10. The following resolution was unanimously adopted: 'It is the opinion and recommendation of the members of the Committee that it should be recommended to the Association of Commerce to declare itself in favor of the use of the Metric System in the United States for the reason that by its universal adoption (1) saving in time will be had in all operations where figuring of weights and measures will enter; (2) because it will lighten the work of the scholars, as they will not have to memorize all the relations between the units of the English system, as the metric is a decimal system; (3) it will also increase saving of brains and energy of men and women that have to work in weights and measures, this meaning a saving of millions of dollars; (4) considering our foreign trade development, the metric system will place the United States of America on equal footing with our foreign competitors.' In adopting the above resolution the Committee is aware of the fact that there is a number of members of other Departments of the Association of Commerce who are opposed to the Metric System, but the Committee is also aware that their opposition is caused by their unfamiliarity with the subject. The Committee feels that it may be the wisdom of the Board of Directors of the Association of Commerce in considering its recommendation to obtain the views of other members not interested in Foreign Trade, and the Committee places itself at the disposal of the Board of Directors to confer with

any member or group of members opposed to the recommendation, in the belief that by an interchange of views on the matter those members opposing the system will secure enough information to permit them to express their opinion consciously.

"At its meeting of 9 November, 1921, the Board of Directors of the New Orleans Association of Commerce took the following action: 'Moved by Mr. McMillan, seconded by Mr. Dietrich and carried, that the principle of the Metric System be approved, and that it should be put into operation when the time is opportune.' Accordingly, the resolution was transmitted to our Representatives in Washington, and to other parties who in our opinion will cooperate in carrying out our wishes."

Denver Civic and Commercial Association, Denver, Colorado: "Acting upon a resolution adopted by the retail merchants' bureau, the board of directors of the Civic and Commercial Association has approved the bill pending in Congress for adopting the metric system." (Denver, Colorado, "News," 2 December, 1921.)

Boston Chamber of Commerce, Boston, Massachusetts, in 1900 passed resolutions urging gradual metric standardization of weights and measures; and the Secretary, Elwyn G. Preston, appeared before Congress in its favor.

Los Angeles Chamber of Commerce, Los Angeles, California (1 December, 1919): "We approve the metric system and recommend that the government adopt it as rapidly as possible."

Oakland Chamber of Commerce, Oakland, California (27 October, 1919): "Endorsement of the Metric System was given by unanimous vote of our Directors."

San Diego Chamber of Commerce, San Diego, California (12 December, 1919): "With reference to the meter-liter-gram proposition, we have taken a referendum of the members of this Chamber of Commerce, and the vote stood as follows: In favor, 119; opposed, 7." Many other important organizations have taken a similar referendum, and of the votes cast a considerable majority favored gradual metric standardization.

Bronx Board of Trade, New York City (20 November, 1919): "The Bronx Board of Trade desires to be placed on record in favor of the introduction of the metric system of weights and measures in the United States and Great Britain."

Easton Board of Trade, Easton, Pennsylvania (23 April, 1920) passed this resolution unanimously: "*Resolved,* that we respectfully urge that the Metric System be adopted by the Congress of the United States of America and by the Parliament of Great Britain as the exclusive standards of weights and measures." In February, 1921, a resolution was adopted in reference to the Metric Standards

Bill: "*Whereas,* this measure provides for the gradual institution of the decimal metric units of weights and measures as the exclusive standards in commercial transactions in the United States after a transition period of 10 years; and *Whereas,* under this act manufacturers may use any weight or measure they elect in production, and *Whereas,* The Board of Trade of Easton has previously endorsed the Metric System, now therefore be it *Resolved,* that we express our approval of the Metric Standards Bill and urge its passage in the interest of business efficiency in our vast domestic trade and our growing foreign commerce."

Akron Chamber of Commerce, Akron, Ohio, thru Vincent L. Stevens, Secretary: "The Board of Directors of the Akron Chamber of Commerce, at a meeting held 5 September, 1919, unanimously adopted a report from our National Affairs Committee recommending that the meter-liter-gram system be adopted as the standard of measurement of the United States of America."

Perth Amboy Chamber of Commerce, Perth Amboy, New Jersey (8 November, 1919): "We have noticed in different periodicals and newspapers an agitation in favor of the Meter-Liter-Gram system of weights and measures. We believe that the adoption of this would save a great deal of money and time by the few nations who do not have it. This is an endorsement for the adoption of those units by America and Great Britain, that we may better do our own work and compete with the rest of the countries in the world's business."

Key West Chamber of Commerce, Key West, Florida (16 February, 1920): "We have notified the Chamber of Commerce of the United States of our endorsement of world metric standardization of weights and measures, and requested our Representatives and Senators to do all in their power for same."

Webster-Dudley Chamber of Commerce, Webster, Massachusetts (20 November, 1919): "A Committee appointed for the consideration of the adoption of meter-liter-gram strongly urge the adoption of this system as follows: '1. It is the logical system because of its simplicity. 2. It is the most universal system in use at the present time and if adopted by the United States and Great Britain it would become the universal system. 3. In view of any expectation that we have for the development of our export trade and it being necessary that all offerings be made on this basis, its adoption becomes absolutely necessary. As the system is found and taught from text-books now in use it does not necessitate any sweeping change in methods of instruction; it merely requires

that more emphasis be placed upon this system in preference to our present method.' "

Galveston Cotton Exchange and Board of Trade, thru its President, I. H. Kempner, "endorses legislation that will bring about the exclusive use of meter-liter-gram by the United States of America." (Petition to Congress, 9 September, 1919.)

Greeley Chamber of Commerce, Greeley, Colorado, thru Elmore Petersen, Secretary (20 April, 1920): "Endorsement of the meter-liter-gram system was given by unanimous vote of our Directors."

Chamber of Commerce of Greenwich, Connecticut, thru Ralph Morrow, Executive Secretary (28 February, 1920): "We are about to conduct a campaign of education here in behalf of the metric system."

Berkeley Chamber of Commerce, Berkeley, California, thru Wells Drury, Managing Director (6 February, 1920): "At a meeting of the Board of Directors of the Berkeley Chamber of Commerce, in regular session, a resolution was adopted by unanimous vote endorsing and favoring national legislation for the adoption and speedy introduction of the Metric System thruout the United States of America. We are convinced that wisdom and patriotic duty call for standardization of our weights and measures, to the end that our manufacturers and our world traders shall not be unnecessarily handicapped in competition with other nations. It is an offense against common sense and the laws of trade for our government to place our producers and merchants at such ruinous disadvantage in the keen struggle for world commerce. We ought to give them a fair chance by supplying them with tools of equal efficiency. This can be done without any great inconvenience or expense by adoption of the metric system."

Bartlesville Chamber of Commerce, Bartlesville, Oklahoma, thru William A. Baylor, Secretary (14 November, 1919): "As a body representing the commercial interests of our city, we are interested in bringing about the best and most convenient system of business thruout the world. It is the desire of our organization to endorse legislation that will bring about the exclusive use of meter-liter-gram by the United States of America."

Casper Chamber of Commerce, Casper, Wyoming, thru Charles B. Stafford, Manager (29 March, 1921): "Our directors at their meeting of 9 March, 1921, endorsed the Metric Standards Bill now before Congress."

Dallas Commercial Club, Dallas, Oregon (6 November, 1919): "This organization has gone on record as favoring the adoption of

the metric system, and has so advised our members in Congress and the President of the United States, and the ruler of Great Britain, these being the only 2 countries not using the metric system." (Representing the Dallas Commercial Club as National Councilor in the Chamber of Commerce of the United States is Hon. Charles L. McNary, Senator from Oregon.)

East Liverpool Chamber of Commerce, East Liverpool, Ohio (The Pottery Center of America), thru W. I. Lewis, Secretary (27 June, 1919): "This organization endorses the exclusive use of meter-liter-gram by the United States of America, and by the British Isles."

Chamber of Commerce of Morgan City and Berwick, Louisiana (27 August, 1919): "We respectfully and unanimously urge that the units of the Metric System be adopted by the Congress of the United States of America and the British Parliament as the exclusive legal standards of weights and measures." J. P. Hebert, Treasurer, writes: "My interest has been centered in this matter for several years, therefore it is always a pleasure to advance its adoption." Will C. Harman, Manager, writes: "A majority of the Senators and Congressmen of this State (Louisiana) have promised favorable consideration of the metric system."

Nogales Chamber of Commerce, Nogales, Arizona, thru Gil Rankin, Secretary: "It was voted that the Nogales Chamber of Commerce endorse the adoption of the metric system of weights and measures by the only countries not now using it. Nothing can give greater impetus to the development of trade with Mexico than American adoption of the metric system of weights and measures to correspond with Mexican usage. . . . Altho I spent but a mite of time learning the metric tables compared with that (in school and since) memorizing our American system (?), I have today a far more comprehensive understanding of the metric. Yankee inclination to save time and effort should have brought about the adoption of the metric system decades ago."

Phoenix Chamber of Commerce, Phoenix, Arizona, thru Harry Welch, Secretary (30 October, 1919): "The Board of Directors have endorsed the metric system."

Tucson Chamber of Commerce, Tucson, Arizona, thru O. S. McPherson (5 January, 1921): "Endorsement of the Metric Standardization system on the part of the United States Government was today approved by action of our Board of Directors."

Point Pleasant Chamber of Commerce, Point Pleasant, New Jersey, thru W. D. Stanford, Secretary (17 March, 1920): "This

Chamber of Commerce made a referendum of its members on the subject of metric standardization, and this resulted in a unanimous vote in favor of metrics."

Richmond Industrial Commission, Richmond, California, thru Paul Edwards, Development and Publicity Agent: "Resolutions in support of meter-liter-gram have been forwarded. Like all sensible organizations, the Richmond Industrial Commission is in favor of this movement. Individual members are also sending endorsements."

Trinidad-Las Animas Chamber of Commerce, Trinidad, Colorado (3 February, 1920): "At a recent meeting of our Board of Directors the meter-liter-gram system was unanimously approved. It is the sentiment of this organization that this system is the solution of the problem of development of extensive world trade by the United States of America."

Tyrone Chamber of Commerce, Tyrone, Pennsylvania (2 June, 1919): "The Board of Directors of the Tyrone Chamber of Commerce in regular meeting unanimously endorsed the proposal for establishment in this country of the Metric System."

Warner Commercial Club, Warner, South Dakota (8 May, 1919): "Resolved, That we urge upon the Government of the United States of America and the United Kingdom of Great Britain and Ireland, the urgency and need of proper legislation to establish the Metric System of weights and measures within their respective jurisdiction, with view of securing uniformity in the civilized world in this respect."

Waukesha Chamber of Commerce, Waukesha, Wisconsin, thru George E. Girling, Secretary (5 April, 1920): "We should be glad to see the Metric System adopted and shall do what we can to assist in having it done. We realize, of course, that its adoption might cause some confusion at first but that would rapidly wear away and in a couple of years people would be used to the Metric System as they now are to our present unsystematic method of weights and measures."

Ottawa Chamber of Commerce, Ottawa, Illinois (22 November, 1921) went on record strongly in favor of the Britten-Ladd Metric Bill (H. R. 10—S. 2267).

Business Men's Club, Fort Smith, Arkansas, thru Ray Gill, Secretary: "At a joint meeting of the Directors of the Business Men's Club and Merchants' Association, held 9 September, 1920, the endorsement of the World Standardization Metric System was

unanimously reaffirmed, the original endorsement having been made several months ago."

Gainesville Chamber of Commerce, Gainesville, Georgia (22 January, 1921): "Resolved, that the Gainesville (Georgia) Chamber of Commerce unanimously endorses the World Metric System and desires to go on record as being heartily in favor of the proposed plan for World Standardization on the Metric System."

Merchants and Manufacturers Association, Mount Vernon, New York, thru M. B. MacCauley, Secretary (21 January, 1921): "The Board of Directors of this Association have unanimously passed a resolution favoring the Metric Standards Bill."

Chamber of Commerce of Michigan City, Indiana, thru W. K. Greenebaum, Secretary-Manager (8 February, 1921): "The Board of Directors unanimously voted in favor of the gradual standardization of weights and measures and adoption in the United States of the metric system bill now before Congress."

Miami Chamber of Commerce, Miami, Florida, thru Guy W. Livingston, Managing Secretary (14 September, 1920): "The matter was carefully considered at a meeting of the Directors of the Miami Chamber of Commerce, and it was unanimously agreed to endorse the action of the International Chamber of Commerce and to give our most hearty approval of the adoption of the Standard Metric System for the United States of America."

Emporia Chamber of Commerce, Emporia, Kansas, thru J. M. Hilton, Secretary (1 February, 1921): "This Chamber of Commerce is in favor of the Metric Standards bill now before Congress."

Illinois Valley Manufacturers Club, La Salle, Illinois (6 December, 1921): "WHEREAS, the United States of America, and Great Britain, (together with their Dependencies and Colonies) are the only ones among the 'Great Family of Civilized Nations,' which have not already adopted for exclusive use the Metric System of weights and measures; and which still cling to the obsolete, confused, inaccurate and misleading system, commonly known as the English System; and,

"WHEREAS, Great Britain is said to be on the point of adopting the Metric System, and, WHEREAS, 43 other nations, consisting of about 200 countries (including colonies) have adopted, and are still using successfully, the Meter-liter-gram or Metric System, which may thus be considered as the 'International,' or 'Universal,' or 'Standard' system of the world; and, WHEREAS, International standardization of weights and measures is essential to both domestic and foreign trade, and tends to promote friendly relations

and commerce among the people of the World; and, WHEREAS, The **Illinois Valley Manufacturers Club** has already placed itself on record by a practically unanimous vote as being in favor of an early change to the Metric System; and, WHEREAS, Indentical bills S. 2267 and H. R. 10 have been prepared with great care so as to effect a gradual change and so prevent, as far as possible, confusion among our citizens, or expense and loss among our fellow manufacturers, now therefore be it RESOLVED, that the Board of Directors of The Illinois Valley Manufacturers Club hereby approves, and endorses, the provisions of the above mentioned identical bills S. 2267 and H. R. 10 as a just, wise, conservative and constructive measure which will benefit, in an incalculable degree, all the people of the United States, and the Manufacturers in particular; and be it further RESOLVED, that the members of the Club and executives of the various factories, are hereby requested to write individual letters to our Congressmen and Senators urging them to vote for the above mentioned bills; RESOLVED, That copies of this resolution be forwarded to the Secretary of Commerce, The Director of the Bureau of Standards, Senator Ladd, Congressman Britten, and to each Senator and Congressman from the State of Illinois in the Congress of the United States." (The **La Salle Chamber of Commerce** also has passed strong resolutions of endorsement of gradual metric standardization.)

Italian Chamber of Commerce in New York (19 April, 1920): "The Italian Chamber of Commerce in New York, an American association, organized and existing under the laws of the State of New York, begs to express its full, hearty and unconditional approval of the bill which is soon to come up in Congress, proposing the adoption for the United States of the Meter-Liter-Gram units of weight and measure."

Holland American Chamber of Commerce, San Francisco, California, thru the Secretary (7 May, 1920): "I beg to inform you that our Chamber of Commerce strongly recommends Metric Standardization for the United States, and we shall be glad if you will mention this fact."

United Bureau of Statistics and Publications, Chicago, Illinois, thru Clyde A. Mann, Manager (26 August, 1919): "We have found the metric pamphlets of the World Trade Club very interesting, and very near akin to an effort which has originated here for enforcement of honest weights and measures, for recognition of the aid to industry which has come from the Bureau of Standards, and

for a reduction in the cost of living in another way than price. We are heartily in accord with the cause you are presenting."

City Retail Merchants League, Jefferson City, Missouri (1 December, 1919): "The Merchants League in convention assembled voted unanimously to endorse any legislation that would bring about the exclusive use of the Meter-Liter-Gram by the United States of America. We trust that action on this advance will come in the very near future."

Wilmington (Delaware) Chapter, American Association of Engineers: "At its meeting of 8 February, 1921, the Wilmington Chapter, American Association of Engineers, unanimously passed a motion favoring the adoption of the metric system in the United States of America."

Cement Contractors' Association, St. Louis, Missouri, thru R. W. Bruner, Secretary (23 May, 1920): "We are heartily in favor of the early adoption of the metric system in this country."

Grocers' and Importers' Exchange of Philadelphia, Philadelphia Bourse, thru John E. Poore, Secretary (9 March, 1921): "At a meeting of the Board of Directors of this Exchange the Committee on Commerce after due consideration recommended that favorable action be taken on the gradual adoption of the Metric System as a standard of weights and measures in the United States of America. Their recommendation was unanimously approved."

Pittsburg Teachers' Association, Pittsburg, Pa. (6 June, 1920), in general meeting advocated adoption of the metric system of weights and measures. Previously the system was indorsed by the board of directors and by the legislative committee of the association.

Teachers' Association of San Francisco, California (26 April, 1920): "Resolved that we, as teachers, approve of the efforts of the World Trade Club to gradually introduce the metric system into the United States of America."

Teachers Union, City of New York, thru Henry R. Linville, President: "The Teachers Union, at a meeting held 12 March, 1921, took action approving the Senate Bill fixing the metric system of weights and measures as a single standard."

Mission Street Merchants Association, San Francisco, California, thru J. C. Marshall, Secretary (16 October, 1920): "Our committee reported favorably on adoption of metric standardization of weights and measures and a resolution to that effect was unanimously adopted. Standardization of weights and measures is

absolutely necessary and will be of tremendous benefit to the English-speaking race."

The Junior League of the City of New York, thru Caramai Carroll, Secretary (4 October, 1920): "We are much in sympathy with the work of the World Metric Standardization Council."

Tarrant County Humane Society, Fort Worth, Texas, thru John M. Adams, General Secretary and Superintendent (29 November, 1920): "It has long been a paradox that the government first establishing decimal coinage should have so long delayed in following it up with a decimal system of weights and measures."

Muskegon Society for the Prevention of Cruelty, Muskegon, Michigan, thru A. M. Wood, Secretary: "The Muskegon Society for the Prevention of Cruelty is heartily in favor of the adoption of the metric standards of weight and measure in the United States of America."

Industrial Fellowship League, Flint, Michigan: "Resolved, that we respectfully urge that the units of the metric system be adopted by the Congress of the United States of America and the British Parliament as the exclusive legal standards of weights and measures. Voted unanimously by the Industrial Fellowship League, a factory men's organization of Flint, Michigan, 11 May, 1920."

Rotary Club, Zanesville, Ohio (9 March, 1920): "The Zanesville Rotary Club has passed a resolution urging legislation that will bring about exclusive use of meter-liter-gram."

Rotary Club, Lawton, Oklahoma (14 March, 1920): "Our committee reported favorably on metric standardization, after which the Club voted unanimously to endorse the same."

Rotary Club, Piqua, Ohio (21 February, 1920): "The Board of Directors, Piqua Rotary Club, went on record as favoring the metric standardization of weights and measures."

Rotary Club, San Antonio, Texas (19 October, 1920): "The Directors of this club indorse metric standardization. We are glad to note that the movement is making distinct progress."

Rotary Club, Chillicothe, Ohio (31 January, 1921), thru A. R. Wolfe, President: The following was unanimously adopted by the Rotary Club of this city after careful discussion and consideration: "*Whereas,* the experience of the recent war has further emphasized the very great need for World Standardization of all weights and measures thru the adoption of Metric Units; and *Whereas,* the present antiquated jumble of weights and measures now in use in the country is a hindrance to education, industry, world trade and

all activities of daily life, and has proved a handicap in the World War, and will handicap us in our future dealings with the other civilized nations of the world, the vast majority of which have now adopted metric standardization with the exception of the United States and the British Isles; and *Whereas,* the metric system is simple, logical and easy to use because it is a decimal system with only 3 units—the Meter, Liter and Gram; now therefore be it *Resolved,* that the Rotary Club of the city of Chillicothe respectfully urges that the Units of the Metric System be adopted by the Congress of the United States of America and the British Parliament as the exclusive legal standards of weights and measures."

Clarendon Ions, Secretary, Kiwanis Club, San Antonio, Texas: "Upon careful investigation and examination, I find the metric movement worthy of the most earnest consideration, and believe it to be a step in the direction of Anglo-American unity, the importance of which is becoming fully recognized by the constructive thinkers of both nations. May I urge for this movement the respect and consideration due action taken by level-headed business men, seeking to accomplish a practical constructive object."

Nicholas G. Vreeland, Secretary, Chamber of Commerce, Metuchen, New Jersey (25 August, 1919): "The metric system is indeed an important subject, and I hope to see official action taken in both England and the United States."

LaVerne R. Collier, Adjutant, Department of Idaho, American Legion (12 December, 1919): "Service men at large, I believe, will be glad to co-operate in endeavoring to obtain legislation for the institution of the metric system. I feel that service men who used the metric system for range-finding and all measurements in France are all of the same opinion on these matters." (A great number of Posts of the **American Legion** have gone on record urging the logical decimal system for the United States of America.)

James E. Sullivan, when Secretary of the Amateur Athletic Union of the United States: "Wherever metric games have been tried in the United States their success has been pronounced and they have been satisfactory in every detail. It is not a matter of mere guess work as to the merits of the metric athletic measurements. Everyone recalls the Olympic Games at the St. Louis Exposition, held under the metric measurements. With the general use of the metric system in the sphere of athletics we could at last have uniform measurements and standard records—standard in the true sense of the word. Under the existing conflict of measurements

it is wellnigh impossible to compare Continental athletic records with our own or England's. Even in the relation of this country to England, in spite of the fact that our athletic distances are practically the same, the use of the metric rules would be of benefit, in that they would smooth out 1 or 2 slight differences now apparent in the runs. I am a firm believer in the universal athletic good that could be accomplished by the general adoption of the system that, already tested, has not been found wanting. Not only in the runs and dashes, but also in such events as the hammer-throw and shot-put would the measures be standardized."

James J. Duffy, when superintendent of the New York Athletic Club, declared: "The use of the metric system in athletics on the continent of Europe has clearly demonstrated its value and superiority over the system we employ in America. I would like to see it used in the New York Athletic Club games."

The metric resolution unanimously passed by the 1921 **National Congress of Mothers and Parent-Teachers Associations** (over 250,000 members), because of its clear statement of the vast educational loss entailed thru clinging to the antiquated measures, is reprinted in full in the "Education" section of Chapter 9, "Who Urges Meter-Liter-Gram?"

The statements which have been given are typical of thousands issued in every part of the United States of America by influential organizations. Chambers of Commerce, Boards of Trade, Manufacturers Associations, Agricultural Associations, Rotary Clubs, Kiwanis Clubs; posts of the American Legion and other orders of veterans of the World War; posts of the Knights of Columbus; many labor organizations; organized women; associations of educators, scientists, physicians, surgeons, attorneys, packers, miners, growers, druggists, opticians, accountants, advertisers; organizations for the prevention of cruelty to animals (and to humans); leaders in the Young Men's Christian Association, in the Young Women's Christian Association; Hebrew Associations; Missionary and Church Associations of all denominations—these and thousands of others are participating in the organized movement to secure the advantages of world metric standardization for the United States of America.

Was ever any movement so unanimous? Note the number of resolutions in favor of the logical metric system which were carried **by unanimous vote!**

PARTIAL LIST OF MEMBER ORGANIZATIONS, CHAMBER OF COMMERCE OF THE UNITED STATES, WHICH HAVE GONE ON RECORD IN FAVOR OF METRIC STANDARDIZATION

Chamber of Commerce, Andalusia, Alabama
Huntsville & Madison County Chamber of Commerce, Huntsville, Alabama
Board of Trade, Tuscaloosa, Alabama
Warren District Commercial Club, Bisbee, Arizona
Chamber of Commerce, Nogales, Arizona
Chamber of Commerce, Tucson, Arizona
Chamber of Commerce, Blytheville, Arkansas
Business Men's Club, Fort Smith, Arkansas
Business Men's Club, Van Buren, Arkansas
Chamber of Commerce, Alhambra, California
Chamber of Commerce, Arcata, California
Bakersfield Civic Commercial Association, Bakersfield, California
Chamber of Commerce, Berkeley, California
Chamber of Commerce, Concord, California
Board of Trade, Fullerton, California
Board of Trade, Hanford, California
Chamber of Commerce, Lindsay, California
Chamber of Commerce, Los Angeles, California
Southern California Wholesale Grocers' Association, Los Angeles, California
Chamber of Commerce, Oakland, California
Chamber of Commerce, Palo Alto, California
Chamber of Commerce, Redding, California
Chamber of Commerce, Riverside, California
Chamber of Commerce, San Diego, California
California Wholesale Grocers' Association, San Francisco, California
Foreign Trade Club of San Francisco (World Trade Club), San Francisco, California
Holland American Chamber of Commerce, San Francisco, California
Chamber of Commerce, San Jose, California
Chamber of Commerce, Santa Ana, California
Chamber of Commerce of Santa Barbara County, Santa Barbara, California
Chamber of Commerce, Santa Rosa, California
South San Francisco Chamber of Commerce, South San Francisco, California

Chamber of Commerce, Vallejo, California
Commercial Association, Boulder, Colorado
Chamber of Commerce, Colorado Springs, Colorado
Civic and Commercial Association, Denver, Colorado
Commercial Club, Fort Collins, Colorado
Chamber of Commerce, Greeley, Colorado
Commercial Association, Longmont, Colorado
Trinidad-Las Animas County Chamber of Commerce, Trinidad, Colorado
Chamber of Commerce, Greenwich, Connecticut
Chamber of Commerce, New London, Connecticut
American Drug Manufacturers' Association, Washington, D. C.
Box Board Manufacturers' Association, Washington, D. C.
National Drug Trade Conference, Washington, D. C.
United States Sugar Manufacturers' Association, Washington, D. C.
Apalachicola Chamber of Commerce, Apalachicola, Florida
Commercial Club, DeLand, Florida
Chamber of Commerce, Key West, Florida
Chamber of Commerce, Lake Worth, Florida
Chamber of Commerce, Melbourne, Florida
Chamber of Commerce, Miami, Florida
Chamber of Commerce, Orlando, Florida
Chamber of Commerce, West Palm Beach, Florida
Chamber of Commerce, Gainesville, Georgia
LaGrange-Troup County Chamber of Commerce, LaGrange, Georgia
Commercial Club, Lewiston, Idaho
Chicago Laundry Owners' Association, Chicago, Illinois
The 4-Ones, Chicago, Illinois
Millinery Jobbers Association, Chicago, Illinois
National Association of Box Manufacturers, Chicago, Illinois
National Association of Loose Leaf Manufacturers, Chicago, Illinois
National Association of Retail Druggists, Chicago, Illinois
National Manufacturers of Soda Water Flavors, Chicago, Illinois
National Refrigerator Manufacturers Association, Chicago, Illinois
Women's Association of Commerce, Chicago, Illinois
Chicago Heights Chamber of Commerce, Chicago, Illinois
Chamber of Commerce, LaSalle, Illinois
Illinois Valley Manfacturers Club, LaSalle, Illinois
Commercial Club, Liberty, Illinois
Chamber of Commerce, Ottawa, Illinois
Illinois Wholesale Grocers Association, Peoria, Illinois

Chamber of Commerce, Columbus, Indiana
Retail Lumber Dealers' Association of Indiana, Crown Point, Indiana
Chamber of Commerce, Fort Wayne, Indiana
Business Men's Association, Greenfield, Indiana
Indiana Wholesale Grocers Association, Indianapolis, Indiana
Chamber of Commerce, Lebanon, Indiana
Cass County Chamber of Commerce, Logansport, Indiana
Chamber of Commerce, Michigan City, Indiana
Chamber of Commerce, Wabash, Indiana
Fort Dodge Commercial Club, Fort Dodge, Iowa
Marshalltown Club, Marshalltown, Iowa
Association of Commerce, Muscatine, Iowa
Commercial Club, Ottumwa, Iowa
Chamber of Commerce, Emporia, Kansas
Commercial Association, Independence, Kansas
Commercial Club, Wellington, Kansas
Association of Commerce, New Orleans, Louisiana
Chamber of Commerce, Auburn, Maine
American Wood Preservers Association, Baltimore, Maryland
Chamber of Commerce, Salisbury, Maryland
Board of Trade, North Attleboro, Massachusetts
Webster-Dudley Chamber of Commerce, Webster, Massachusetts
Chamber of Commerce, Ann Arbor, Michigan
Community Association, Charlotte, Michigan
Board of Commerce, Flint, Michigan
Association of Commerce, Houghton, Michigan
Chamber of Commerce, Mount Pleasant, Michigan
Chamber of Commerce, Niles, Michigan
Commercial Club of Fergus Falls, Fergus Falls, Minnesota
Northern White Cedar Association, Minneapolis, Minnesota
National Tent and Awning Manufacturers, St. Paul, Minnesota
Chamber of Commerce, Greenwood, Mississippi
Chamber of Commerce, Chillicothe, Missouri
Chamber of Commerce, Joplin, Missouri
American Wholesale Garment Association, St. Louis, Missouri
National Ornamental Glass Manufacturers Association of The United States and Canada, St. Louis, Missouri
St. Louis Wholesale Grocers' Association, St. Louis, Missouri
Chamber of Commerce, Butte, Montana
Chamber of Commerce, Chinook, Montana
Chamber of Commerce and Agriculture, Glasgow, Montana
Retail Merchants Association of Montana, Helena, Montana

Chamber of Commerce, Lewistown, Montana
Chamber of Commerce, Miles City, Montana
Chamber of Commerce, Red Lodge, Montana
Community Club, Reed Point, Montana
Nebraska Manufacturers Association, Lincoln, Nebraska
Manufacturers Association, Omaha, Nebraska
Community Service Club, Ord, Nebraska
Chamber of Commerce, Reno, Nevada
Chamber of Commerce, Mays Landing, New Jersey
Chamber of Commerce, Paterson, New Jersey
Chamber of Commerce, Perth Amboy, New Jersey
Chamber of Commerce, Point Pleasant, New Jersey
Woodbine Board of Trade, Woodbine, New Jersey
Chamber of Commerce, Ballston Spa, New York
Chamber of Commerce, Mt. Vernon, New York
American Specialty Manufacturers Association, New York City
Associated Motion Picture Advertisers, Inc., New York City
Association of American Wood Pulp Importers, New York City
Associated Flower & Fancy Feather Manufacturers of America, New York City
Bronx Board of Trade, New York City
Franco-American Board of Commerce & Industry, New York City
Furniture Manufacturers Association of New York, New York City
Harlem Board of Commerce, New York City
Italian Chamber of Commerce in New York, New York City
Millinery Chamber of Commerce, New York City
Music Industries Chamber of Commerce, New York City
National Association of Clothiers, New York City
National Association of Electrical Contractors and Dealers, New York City
National Association of Motion Picture Industry, Inc., New York City
National Shoe Wholesalers Association of the United States, New York City
National Wholesale Druggists Association, New York City
National Wholesale Grocers Association of the United States, New York City
New York Lumber Trade Association, New York City
New York Wholesale Grocers Association, New York City
Norwegian American Chamber of Commerce, Inc., New York City
Swedish Chamber of Commerce, New York City
Tubular Plumbing Goods & Tank Fittings Exchange, New York City

North Dakota Retail Merchants Association, Fargo, North Dakota
Commercial Club, Grand Forks, North Dakota
Association of Commerce, Minot, North Dakota
Chamber of Commerce, Akron, Ohio
Chamber of Commerce, Athens, Ohio
Chamber of Commerce, Chillicothe, Ohio
Mirror Manufacturers' Association, Cincinnati, Ohio
Chamber of Commerce, Columbus, Ohio
Southern Ohio Coal Exchange, Columbus, Ohio
Sewing Machine Manufacturers Association, Dayton, Ohio
Chamber of Commerce, East Liverpool, Ohio
Chamber of Commerce, East Palestine, Ohio
Chamber of Commerce, Hamilton, Ohio
Chamber of Commerce, Mansfield, Ohio
Chamber of Commerce, Middletown, Ohio
Chamber of Commerce, Bartlesville, Oklahoma
Chamber of Commerce, Mangum, Oklahoma
Chamber of Commerce, Poteau, Oklahoma
Commercial Club, Bend, Oregon
Commercial Club, Dallas, Oregon
Board of Trade, Easton, Pennsylvania
Chamber of Commerce, Lebanon, Pennsylvania
Commercial Museum, Philadelphia, Pennsylvania
Pennsylvania, New Jersey & Delaware Wholesale Grocers Association, Philadelphia, Pennsylvania
Philadelphia Bourse, Philadelphia, Pennsylvania
American Warehousemen's Association, Pittsburgh, Pennsylvania
Chamber of Commerce, Pottsville, Pennsylvania
Board of Trade, Scranton, Pennsylvania
Chamber of Commerce, Titusville, Pennsylvania
Chamber of Commerce, Tyrone, Pennsylvania
Chamber of Commerce, Rock Hill, South Carolina
Chamber of Commerce, Mitchell, South Dakota
Commercial Club, Pierre, South Dakota
Southern Industrial Insurer's Conference, Nashville, Tennessee
Galveston Cotton Exchange & Board of Trade, Galveston, Texas
Chamber of Commerce & Business Men's Club, San Antonio, Texas
Chamber of Commerce, Victoria, Texas
Chamber of Commerce, Ogden, Utah
Commercial Club and Chamber of Commerce, Salt Lake City, Utah
Commercial Club, Camas, Washington

Chamber of Commerce & Commercial Club, Seattle, Washington
Chamber of Commerce, Morgantown, West Virginia
Association of Commerce, Green Bay, Wisconsin
Chamber of Commerce, Marshfield, Wisconsin
Association of Commerce, Sheboygan, Wisconsin
Association of Commerce, Waukesha, Wisconsin
Chamber of Commerce, Wisconsin Rapids, Wisconsin
Chamber of Commerce, Casper, Wyoming
Chamber of Commerce, Anchorage, Alaska
Commercial Club, Fairbanks, Alaska
Northwestern Alaska Chamber of Commerce, Nome, Alaska
Chamber of Commerce, Honolulu, T. H.
Chamber of Commerce of the Philippine Islands, Manila, P. I.
Chamber of Commerce of the United States of America, Buenos Aires, Argentina
American-Belgian Chamber of Commerce, Bruxelles, Belgium
American Chamber of Commerce for Brazil, Rio de Janeiro, Brazil
American Chamber of Commerce, Sao Paulo, Brazil
American Chamber of Commerce for Italy, Milan, Italy
American Chamber of Commerce of Italy, Naples, Italy
American Chamber of Commerce of Tampico, Tampico, Mexico
American Chamber of Commerce for Spain, Barcelona, Spain
American Chamber of Commerce for the Levant, Constantinople, Turkey
And scores of others.

PARTIAL LIST OF OTHER COMMERCIAL ORGANIZATIONS IN THE UNITED STATES OF AMERICA, URGING GRADUAL METRIC STANDARDIZATION

Southern Commercial Congress
Retail Merchants Association of Texas, Fort Worth, Texas
Oregon State Retailers' Association, Portland, Oregon
Retail Trade Bureau, Seattle, Washington
International Association of Teachers of Printing (thru Joseph A. Donnelly, President; New York City)
Young Men's Business League, Houston, Texas
Rhode Island Business League, Greenville, Rhode Island
Mississippi Valley Association
Pacific Coast Merchant Tailors' Association
Grocers and Importers Exchange of Philadelphia, Pennsylvania
Italian Chamber of Commerce, San Francisco, California
Belding Board of Commerce, Belding, Michigan
Yakima Commercial Club, Yakima, Washington
Santa Monica-Ocean Park Chamber of Commerce, Ocean Park, California
Manufacturers' Club of Michigan City, Michigan City, Indiana (thru Bert Blocksom, President)

Merchants and Manufacturers Association, Mt. Vernon, New York (thru M. B. MacCauley, Secretary)
The Mexican Society of New York, Inc. (thru Francisco Juirez, President)
Greater Muscatine Committee, Muscatine, Iowa (thru Ralph D. Chamberlain, Secretary)
Madison Community Club, Madison, Nebraska
Morgan City and Berwick Chamber of Commerce, Morgan City, Louisiana
Chamber of Commerce of the County Seat of Nevada County, California
Richmond Industrial Commission, Richmond, California
Commercial Club of Warner, South Dakota
Chamber of Commerce, Lakeland, Florida
Chamber of Commerce, Chico, California
Chamber of Commerce, Ukiah, California
Chamber of Commerce, Colville, Washington
Chamber of Commerce, Elizabethtown, Illinois
Chamber of Commerce, LaJolla, California
Chamber of Commerce, Laredo, Texas
Chamber of Commerce, Marshall, Texas
Chabmer of Commerce, Newport Beach, California
Chamber of Commerce, Plattsburgh, Missouri
Chamber of Commerce, Redlands, California
Chamber of Commerce, St. Helens, Oregon
Chamber of Commerce, Swainsboro, Georgia
Chamber of Commerce, Venice, California
Chamber of Commerce, Wellston, Missouri
Stanislaus County Board of Trade, Modesto, California
Blue Earth Commercial Club, Blue Earth, Minnesota
Board of Trade, Anaheim, California
Board of Trade, Eustis, Florida
Board of Trade, Toms River, New Jersey
Commercial Club, Boise, Idaho
Commercial Club, Canby, Minnesota
Commercial Club, Cove, Oregon
Commercial Club, Dickinson, North Dakota
Commercial Club, Sauk Rapids, Minnesota
Manufacturers' Association, South San Francisco, California
Northside Business Club, Cincinnati, Ohio
100% Club, San Francisco, California
South Side Business Men's Association, Chicago, Illinois
Old Town Merchants and Manufacturers Association, Baltimore, Maryland
Young Men's Business Association, Nogales, Arizona
Richmond Manufacturers' Association, Richmond, California
Automobile Repairers of San Francisco, California
Draymen's Association of San Francisco, California
San Jacinto Growers' Association, San Jacinto, California
Automobile Body Builders, Painters and Trimmers Association, San Francisco, California
Swedish Society of San Francisco, California
California Division, Travelers' Protective Association
Traffic Efficiency Bureau, San Francisco, California
Blue Ridge League of Virginia, Waynesboro, Virginia
Challenge Cream and Butter Association, Los Angeles, California

Chestnut Street Association of Philadelphia, Pennsylvania
Civitan Club, Birmingham, Alabama
Civic Betterment Union of Salt Lake City, Utah
Clintonville Advancement Association, Clintonville, Wisconsin
Consumers' League of Ohio, Cleveland, Ohio
Horicon Advancement Association, Horicon, Wisconsin
Kansas Retail Butchers' Association, Osage City, Kansas
Lawndale and Communities Improvement Association, Lawndale, California
Japanese Chamber of Commerce, San Francisco, California
Columbia Commercial Club, Columbia, Missouri
Little Rock Cotton Exchange, Little Rock, Arkansas
Little Rock Grain Exchange, Little Rock, Arkansas
Merchants' and Manufacturers' Association, Redlands, California
Ohio Automobile Trade Association, Columbus, Ohio
Ohio Valley Retail Shoe Dealers' Association, Cincinnati, Ohio
Oklahoma Utilities Association
Oregon State Hotel Association, Portland, Oregon
Retail Confectioners' Association of Oregon, Portland, Oregon
Viroqua Advancement Association, Viroqua, Wisconsin
Wholesale Fruit and Produce Merchants Credit Association, San Francisco, California
Wholesale Shoe League, New York City
Cement Contractors' Association, St. Louis, Missouri
Bakers' Mutual Co-operative Association, Newark, New Jersey

SUPPLEMENTARY LIST TYPICAL OF THE THOUSANDS OF ORGANIZATIONS THRUOUT THE UNITED STATES OF AMERICA URGING GRADUAL METRIC STANDARDIZATION OF WEIGHTS AND MEASURES

American Institute of the City of New York; Aero Club of Detroit, Michigan; Alumni Association, University of Florida; Philadelphia Rifle Club, thru Albert T. Amann, Secretary; American Federation of Human Rights, thru W. L. Krotona-Ragoczi, Hollywood, California; Wagner Free Institute of Science, Philadelphia, Pennsylvania; Warren County Medical Society, Warren, Pennsylvania; American Legion, Virginia Department, Richmond, Virginia; Brotherhood of Railroad Trainmen, Lodge No. 68, Ogden, Utah; California Badger Club, Los Angeles, California; Chemistry Club of Grinnell College; Chicago Committee of French Red Cross; Chicago Norske Klub, Chicago, Illinois; Composition Roofers' Union, No. 21, Los Angeles, California; Cotton Plant Automobile Club, Cotton Plant, Arkansas; East End Council, 247, Royal Arcanum, Pittsburgh, Pennsylvania; East Tacoma Encampment, No. 53, I. O. O. F., Tacoma, Washington; Engineers' Club, Minneapolis, Minnesota; Engineers' Club of Philadelphia; Entiat Fruit Growers' League, Entiat, Washington; Equitable Life Assurance Society of New York; Esperanto Office of Detroit, Michigan; Federated Alumni of the University of Buffalo; General Fertilizer Association, San Bernardino, California; Harmony Lodge, No. 13, I. O. O. F., San Francisco, California; Independent Order of Puritans, Pittsburgh, Pennsylvania; Indiana Retail Jewelers' Association, Auburn, Indiana; Indiana State Conference Board of the International Molders Union of North America; International Association of Machinists, Lodge No. 303, Rochester, New York; Eastern Lodge,

No. 387, I. O. O. F., Detroit, Michigan; Florida Lodge, No. 1, I. O. O. F., Jacksonville, Florida; Golden Link Lodge, No. 167, I. O. O. F., Minneapolis, Minnesota; International Order of Good Templars, Kampen Lodge, No. 15, Worcester, Massachusetts; Keokuk Council, No. 400, United Commercial Travelers of America; Kiwanis Club, Albuquerque, New Mexico; Kiwanis Club, Battle Creek, Michigan; Jonathan Wood Lodge, No. 30, Knights of Pythias, Memphis, Tennessee; Liberty Lodge, No. 18, Knights of Pythias, St. Louis, Missouri; Mount William Lodge, No. 105, Knights of Pythias; Nicollet Lodge, No. 46, Knights of Pythias, Minneapolis, Minnesota; Unity Lodge, No. 4, Knights of Pythias, Minneapolis, Minnesota; Unity Lodge, No. 61, Knights of Pythias, San Francisco, California; Lincoln Central Labor Union, Lincoln, Nebraska; Los Angeles Motor Boat Club, Los Angeles Harbor, California; Milwaukee Engineering Society, Milwaukee, Wisconsin; The Modern Samaritans, Hiawatha Council, No. 25, M. S., Minneapolis, Minnesota; Montana Lodge, No. 13, Knights of Pythias, Anaconda, Montana; Musicians' Union, No. 6, American Federation of Musicians, San Francisco, California; Branch No. 195, National Association of Letter Carriers, St. Joseph, Missouri; Muskegon Teachers' Club, Muskegon, Michigan; National Council, The Knights and Ladies of Security, Pacific Council No. 457, St. Joseph, Missouri; National Social Unit Organization, Cincinnati, Ohio; New Hampshire Federation of Women's Clubs, Concord, New Hampshire; New York County Registered Nurses' Association, New Rochelle, New York; North Pacific Conference of Optometry; Northern Ohio Druggists' Association, Cleveland, Ohio; Pennsylvania Numismatic Society; Priest River National Farm Loan Association, Priest River, Idaho; Salt Lake County Chiropractors' Association, Salt Lake City, Utah; Scandia Co-operative Association, Escanaba, Michigan; Seventh Ward Improvement Association, New Orleans, Louisiana; Snoqualmie Tribe, No. 5, Imp. O. R. M., Tacoma, Washington; Society of Arts and Crafts, Detroit, Michigan; Sons of Norway, Dovre Lodge, No. 3, Minneapolis, Minnesota; South Gate Lodge, No. 320, F. and A. M., Los Angeles, California; Lodge Gustav V., No. 175, Vasa Order of America, San Diego, California; West Side Fruit Growers' Association, Cupertino, California; Western Pennsylvania Numismatic Society; Winona Teachers' Federation, Winona, Minnesota; Yakima Fruit Growers' Association, Yakima, Washington; York County Medical Society, York, Pennsylvania; Caledonian Club of San Francisco, California; Colorado State Society, San Diego, California; California Division, Travelers Protective Association; Sutro Heights Improvement Club, San Francisco, California; Pacific Coast Numismatic Society; San Francisco Camp No. 4, National Indian War Veterans, San Francisco, California; California Chapter, American Chemical Society; California Alpha of Tau Beta Phi (national engineering honor society); San Francisco Chapter, American Institute of Architects; Willow Hill Lodge, No. 884, I. O. O. F., Willow Hill, Illinois; Duquesne Council, Knights of Columbus, No. 264, Pittsburgh, Pennsylvania; Napa Lodge, B. P. O. E., Napa, California; Lancaster County Medical Society, Nebraska; Kings County (N. Y.) Department, American Legion; Lehigh Valley Metric Association, Easton, Pennsylvania; Ida County Medical Society, Battle Creek, Iowa; City Playground League of New York; Hidalgo County Medical Society, McAllen, Texas; Fortnightly Club of Grand Forks, North Dakota; St. Louis Chemical Society, St. Louis, Missouri; New York State Science Teachers' Association; New York State Associated Academy Principals; New York State Training School Teachers Association;

New York Drawing Teachers' Club; New York State Teachers' Association; Dental Society of the District of Columbia; Woman's Club, Stuart, Florida (110 members); New York Academy of Sciences (vote taken 13 May, 1920, showed more than 90% of members favor exclusive use of metric units); Society of American Wars, Commandery of State of New York; Brooklyn Federation of Jewish Charities, Brooklyn, New York (thru Max Abelman, Secretary); Torrey Botanical Club, New York City; Executive Committee, Architectural League of New York; Louisiana State Medical Society, New Orleans, Louisiana; Medical Society of the State of Pennsylvania; Iowa State Medical Society, Des Moines, Iowa; New Mexico Electrical Association; Montana Society of Certified Public Accountants, Helena, Montana; North Dakota Society of Engineers, Bismarck, North Dakota; Minnesota Horse Breeders' Association, St. Paul, Minnesota; American Legion, Department of New York (thru Hugh W. Robertson, New York City); Kings County Department, American Legion, Brooklyn, New York; Colonel William Jay Schieffelin, President, Citizens Union of New York City; Lodge 1224, Benevolent Protective Order of Elks, St. Petersburg, Florida; Chinese Student Christian Association in North America; Chinese Students Alliance in the United States of America; Women Lawyers Association (national); Logan County Medical Society, Lincoln, Illinois; I. O. O. F., No. 67, Fort Meade, Florida; Wichita County Dental Society, Wichita Falls, Texas; Divide Tonopah Chamber of Mines, Tonopah, Nevada.

It is not only within the borders of the United States that Americans have been working for meter-liter-gram. As has been indicated, our interests are bound up in numerous world organizations, and these have taken action with great unanimity in behalf of the metric system. In closing this chapter, it is well to indicate world opinion as revealed in the declarations of these organizations:

International Chamber of Commerce (1920): "*Whereas,* The International Chamber of Commerce has adopted as its first principle a policy of hearty world co-operation; and

"*Whereas,* There does exist at the present time a bewildering confusion in the weights and measures of the allied nations; and

"*Whereas,* This confusion and waste during the world war was an element of serious inconvenience and in time of peace acts as an obstacle to efficient world co-operation; now, therefore, be it

"*Resolved,* That the Board of Directors of the International Chamber of Commerce recommend that in the whole world an uniformity of weights and measures be used, in order to facilitate international commerce."

At the organization meeting of the International Chamber of Commerce, Paris, June, 1920, the following was adopted by the United States of America Standardization Committee, and also by the Group on Production: "Resolved, That the International Chamber of Commerce in meeting duly assembled, urges world uniformity of weights and measures as a means of facilitating com-

merce thru co-ordination, standardization and simplification; and further that the British Empire and the United States of America forthwith standardize on the Metric System solely." (Referred to the Board of Directors.)

International Red Cross, thru the Secretariat, Geneva, Switzerland: "The International Red Cross Committee, which watches with the most careful attention any endeavor to foster international order, can not but applaud the campaign undertaken to unify weights and measures."

First International Conference of American States, Washington, D. C. (1889-1890): "Resolved, That the International American Conference recommends the adoption of the metrical decimal system to the nations which have not already adopted it." (See report of committee, in Senate Metric Hearings, 1921; part 2, pp. 127-129.) **Fourth International Conference,** held at Buenos Aires, 1910, recommended "the rigorous observance of the decimal metric system, so as to procure a possible uniformity in all that relates to weights and measures."

United States Section, Inter-American High Commission: At the 1918 session, it was resolved "that the best interests of the country will be served by the passage of the Metric Standards bill." Resolution adopted on 7 October, 1918: "The United States section of the International High Commission, having in view the present efforts to bring about the exclusive use of the metric system of weights and measures within the jurisdiction of the United States, resolves: That in the opinion of the section, the adoption of the system would be productive of great advantage in the commercial relations of the United States with the other American Republics." (See testimony of Constantine E. McGuire, of the Inter-American High Commission, before Senate Metric Committee, 1921.)

Pan-American Financial Conference, 1920: "Resolved, That the Conference recommends that the Metric System of weights and measures be universally employed, and that pending the attainment of that end, articles weighed and marked, and shipping documents prepared according to the system of weights and measures now prevailing in the United States, should be accompanied with statements giving the equivalents under the Metric System."

Pan-American Federation of Labor, thru Canuto A. Vargas, Secretary (21 May, 1920): "The Metric System is the standard thruout Latin-America, and its adoption in the United States as the standard, would greatly facilitate the trade with all of the peoples to the South of the Rio Grande."

L. S. Rowe, Director General, **Pan American Union** (16 December, 1920): "I have so long been of the firm conviction that the United States of America should take the important step of putting itself in touch with the standard scientific usages of the world, that I have no hesitation in endorsing the movement which the World Metric Standardization Council has set on foot, and in expressing my sincere hope that the attention of the professional and business communities in this country be drawn to the subject during the next year or 2, in order that public opinion may be informed and the enactment of appropriate legislation facilitated. I have examined at one time or another all the contentions of those who opposed the adoption of the Metric System, and I find no valid ground for the allegation sometimes made that the change will involve widespread loss and confusion. The change need not be made overnight; there will be time for adjustment of appliances in the industrial world generally, and time for the schools and the press to familiarize the public generally with the units and terminology of the new system. I feel that the schools could do a good deal more than they are doing, even as things are, and that business organizations everywhere could exert a more effective and lasting influence than has been the case up to this time." (21 January, 1921:) "Every issue of the 'Bulletin of the Pan American Union' in all 3 editions, English, Spanish and Portuguese, in all Latin American matters touching measures (whether commercial statistics, railways, industrial development or other) uses metrics to the exclusion of all other measures. Especially in commercial statistics, almost every page and line of our publications emphasizes the metric dominance in those countries. Frequently, we convert United States statistical reports into metric units and nomenclature. From time to time we have published special articles on the metric situation."

International Metallurgical and Chemical Society, thru the Secretary, Billings, Montana, United States of America (5 April, 1920): "This organization has solidly supported and urged the universal adoption of the metric system of standardization."

International Geneva Association of Hotel and Restaurant Employees, with headquarters at 143 West 44th Street, New York City: "Resolved, That the International Geneva Association of Hotel and Restaurant Employees, with Branches (360) all over the world and with a membership of over 22,000, fully endorses and favors metric standardization of weights and measures in the United States of America, British Isles and Canada." It was further resolved that this resolution, passed unanimously by the Board of Administration, be spread upon the minutes and published in the Association's official organ, "The Hotel Industry."

The Chamber of Commerce of the United States held an **International Trade Conference** at Atlantic City from 20 thru 24 October (1919) in order that representatives of Britannia, France, Italy and Belgium might lay before the business men of the United States of America the commercial needs and aspirations of their respective nations. The following request was presented to the Resolution Committee: "The Undersigned Foreign Missions to the International Trade Conference at Atlantic City, 20-24 October, 1919, respectfully request the Chamber of Commerce of the United States of America that in 'The Daily Bulletin of the International Trade Conference,' in all printed reports of the Conference, and in the report of the proceedings of the Conference which will be printed in 'The Nation's Business' all non-metric weights and measures be followed by their equivalent in the international metric system." This request was signed for the **Belgium Mission** by M. Albert E. Janssen, Director, National Bank, Belgium, Professor of University of Louvain; for the **British Mission** by Hon. J. G. Jenkins, Member of Finance, **London Chamber of Commerce,** and Bailie John King, Chairman, National Light Castings Association, Glasgow; for the **French Mission** by M. Tirman, Councillor of State, Representative of **French Ministry of Commerce,** and for the **Italian Mission** by Commander Dr. Luigi Luiggi, Member of the State Council of Public Works, Professor at the University of Rome, and Commander Prof. Vittoria Meneghelli, President **Chamber of Commerce of Venice.**

International Sunshine Society, thru Mrs. John Alden, President-General, 96 5th Avenue, New York City (28 February, 1920): "Our society will do everything possible to help in the cause of world metric standardization."

International Association of Rotary Clubs, thru its official organ, "The Rotarian," October, 1919: "The cumbersome system of weights and measures in use by the British Empire and the United States had its origin in Germany. The war with Germany forced these countries to abandon that system in military affairs, for the simpler and more scientific metric system. Germany has abandoned the old system and adopted the metric system in 1871, not only in military affairs but in all affairs. How much of Germany's success in gaining world trade was due to her use of a system of weights and measures uniform with the systems used by the countries where she sought trade? How much will Britannia and America be handicapped by retaining the old system forced upon England hundreds of years ago by the old German Hanseatic League?" (See typical resolutions by Rotary Clubs urging metric standardization, earlier in this chapter.)

International 100% Club, representing substantial business interests in the United States and Canada, at its annual convention in Seattle, Washington, September, 1921, unanimously passed a resolution in favor of metric standardization, concluding thus: "*Whereas,* the International 100% Club, by reason of the broad commercial and industrial interests of its membership, and particularly because of its international character is vitally interested in the speedy adoption of worldwide uniform standards of weights and measures; now, therefore, be it *Resolved,* that the International 100% Club respectfully urges that the units of the Metric System be adopted by the Congress of the United States as the legal standards of weights and measures after a transition period of 10 years, as proposed in bills now before the Senate and House of Representatives."

Chamber of Commerce of the Philippines, Manila, P. I. (20 May, 1920): "We join in the important campaign in favor of the establishment of the decimal metric system in the English-speaking countries. We believe, in fact, that the accomplishment of this project is indeed a necessity. Modern commercial intercourse needs standardization of weights and measures thruout the world; and this unity can be brought about no more simply than thru the metric system. North America and the British Isles, being at the commercial head of the world, should be the most interested in seeing this system adopted."

Chamber of Commerce of the United States of America in the Argentine Republic, Buenos Aires, Argentine (22 March, 1920): "The Chamber of Commerce of the United States of America in the Argentine Republic considers that no one single measure would so redound to the facilitating of the exchange of products and commodities between the Argentine Republic and the United States of America as the adoption by this latter country of the Metric System."

American Chamber of Commerce in Spain, thru the President, Barcelona, Spain (16 March, 1920): "The desirability and I may say the necessity of American manufacturers and export merchants adopting the metric system is not a debatable question as far as our members are concerned. I am pleased to inform you therefore that this Chamber and all of its members are unanimously in favor of such action." (Request a Referendum of the Chamber of Commerce of the United States.)

American Chamber of Commerce in Belgium, Brussels, Belgium (30 March, 1920): "Be it resolved that the American Belgian Chamber of Commerce in Belgium hereby appeals to the Government of the United States urging the prompt adoption of the metric

system, and that it heartily endorses the movement already well in hand in the United States of America amongst trade communities towards this end."

American Association of Trade and Commerce, Berlin, Germany (February, 1920): "The cry now going forth from the commercial press in America for the universal adoption of the metric system of weights and measures is heartily supported by this Chamber of Commerce. It constitutes the first step towards reducing the dead load of international commerce and trade."

American Chamber of Commerce for Italy, thru O. M. Smart, Secretary, Milan (13 November, 1919): "The desirability of using the Metric System is axiomatic in all foreign trade. Therefore, we are writing the Chamber of Commerce of the United States urging the adoption of this system."

American Chamber of Commerce for the Levant, thru L. S. Moore, Executive Secretary, Constantinople (7 April, 1921): "The metric system is in universal use in the Levant and extension of its use rather than diminution may be anticipated for the future. Doubtless the United States of America will come to the realization of what seems logical in the system of measurements." (This organization was established in 1911, to extend American trade in the Near East; publishes "Levantine Trade Review.")

American Chamber of Commerce of Tampico, Mexico, thru Erby E. Swift, General Manager (9 April, 1920): "Nothing could be done that would be of more benefit to the foreign trade of the United States than the adoption of the Metric System. We American business men in Mexico realize it more than our brother business men at home. We wish to state that there is no greater detriment to the furthering of trade between the 2 countries than the fact that the United States does not use the Metric System. It causes unending error and work. This Chamber of Commerce, with a membership of more than 400, approves of the effort to establish the Metric System in the United States of America."

Among the other American commercial organizations abroad which have endorsed world metric standardization are the American Chamber of Commerce of Italy, Naples, Italy; American Chamber of Commerce for Brazil, Rio de Janeiro; and many others. What better testimony of the worth of metric units in actual practice? These organizations are made up of **American business men,** trained observers, who are right on the ground and who unqualifiedly declare the world metric standards successful in everyday use and far preferable to our antiquated jumble of weights and measures, which most of the enlightened nations scrapped long ago.

The organized business men of other countries are alive to the importance of the English-speaking peoples taking up the world units. Scores of chambers of commerce abroad have communicated with the World Metric Standardization Council, and have made their sentiment for world uniformity known thru the International Chamber of Commerce. A number of letters may be cited as typical of the trend of world thought in organized business:

Chamber of Commerce of Bordeaux, France: "Relative to the general adoption in the English-speaking countries of the decimal metric system of weights and measures, we are very firmly convinced of the advantages that would come from the closer relationship brought about by the adoption of this system. We have therefore voiced an opinion unanimously in favor of the adoption of the plan."

Chamber of Commerce of Blois, France, thru the President, Albert Poulain, Officer of the Legion of Honor (15 July, 1919): "In regard to the general adoption of the metric system of weights and measures by all the allied powers, I have the pleasure to say that my organization has already several times expressed itself as believing that this **unification** ought to be made worldwide. Petitions are addressed to Mr. David Lloyd-George at London, and to President Wilson at Washington."

Association of Commerce and Industry, La Chaux-de-Fonds, France: "We consider it our duty to aid in the campaign for the introduction of the metric system in the British Isles and the United States of America, for we know how greatly the introduction of this system would facilitate commercial transactions."

Chamber of Commerce of Rouen, France: "Under date of 17 July, 1917, the Chamber of Commerce of Rouen went on record as believing that the decimal metric system ought to be adopted by all the allied powers in order to facilitate friendly commercial relations after the world war. This vote has been sent to the proper authorities."

Chamber of Commerce of Béziers, France: "Our Chamber of Commerce has long been interested in this question of the adoption of the metric system in the English-speaking countries, a question which we consider very important. We took a vote on this matter at our meeting of 5 July, 1917, passing the following resolution: "Voted that, The French Government petition the British Government requesting that every possible step be taken to institute and spread thruout all the territories under British jurisdiction the decimal Metric System of weights, measures and moneys, already used by practically every nation."

At this meeting of the Chamber of Commerce of Béziers, important points were brought out: "If, after the victory in the world war, the Allies wish to **win economic prosperity** also, they will be obliged to join together in a commercial way as closely as they are today on the field of battle. This will not be possible unless there be a certain degree of broadmindedness and a disposition to make concessions one to the other in matters of custom and taste. It is very difficult to carry on commerce between peoples who do not employ the same weights, the same measures, and the same system of money. A close union of the Allies, such as has been referred to, would not be complete unless they had this uniformity. . . . Have we not the right to ask the English-speaking people to make this slight sacrifice of tradition—we French, who have also great pride in our traditions? Have we not abandoned our meridian of Paris, for us a glorious memory, and our *"Huere Nationale"* in order to regulate our time in accordance with the Greenwich meridian? This sentiment of reciprocity should be added to the many practical advantages of the Metric System, as reason for the advance. The English-speaking peoples, eminently practical, will see that they have an interest like all the rest of the world in making the Metric System universal. At the hour when England, France and America are mingling their blood on the field of battle in the cause of civilization, that moment seems well-chosen for lowering the barrier which is caused by a **diversity** in weights and measures and money."

National Society for the Encouragement of Industry, Paris, France, thru A. G. Lemaire, General Agent: "We endorse the metric campaign, and have sent petitions to the President of the United States of America, and the British Premier, requesting the adoption of the metric units for exclusive use as legal standards in their respective countries."

Society of Civil Engineers of France: A communication from the *Societé des Ingenieurs Civils de France,* containing the following resolution of its Council, was presented to the Board of Directors of the American Institute of Mining Engineers and ordered printed in its official magazine, "Mining and Metallurgy," May, 1920: "The *Societé des Ingenieurs Civils de France,* in sending fraternal greetings to the American Institute of Mining Engineers desires to draw the attention of its council of direction and of its members to the immense advantages which would result from the obligatory adoption of the metric system by the great American union.

"If the *Societé des Ingenieurs Civils de France* feels that it ought to take this initiative now, it is because it has been informed of the

existence in America of **activities calculated to mislead** public opinion, and which, if successful, would result in depriving their American colleagues of that of which they themselves realize the value every day.

"It is also because in the year 1903, during which similar activities **originating from the same source** had already been noted, the **American Chamber of Commerce of Paris** had applied in full confidence to the *Societé des Ingenieurs Civils de France* for information placing it in condition to know the truth."

Chamber of Commerce of Liege, Belgium, 1 July, 1920: "The Chamber of Commerce of Liege entirely favors world use of the metric units. The experience of Belgium which has used the metric system now for a century and a quarter, has shown the excellence of this unified system of weights and measures. The opposition from certain people who before habitually criticised the step has long since stopped.

"It ought to be the same in Britain and the United States of America. One asks even now how these 2 great countries resist joining in using a system which for many years has worked so well in all the other countries of the world."

Central Normalistic Bureau (Main Committee for Standardization in the Netherlands), Delft, Netherlands, thru E. Nymans (13 November, 1919): "On the day that America will sacrifice the antiquated system of measures, considerable loss of material, brainwork and time will be saved not only for its own industry, but also for that of all countries that are in commercial relation with the United States of America."

Agricultural Society of Colombia, Bogota, Colombia (March, 1920): "The firm and special desire of Colombia is to keep to the metric system, and to avoid any mixture and complications with other systems."

Hundreds of associations thruout the world have participated in the organized effort to secure world **uniformity** of weights and measures. Besides those already cited, mention may be made of the Chambers of Commerce of Paris, Bourges, Cette, and Nimes, in France; Bruges and Ostend, in Belgium; Dordrecht and Hengelo, in the Netherlands; Catania, in Italy; Nakatan, in Japan; the Royal Society of Engineers in the Netherlands, and so on. The Society of Ladies, Kalamata, Greece, aided powerfully in securing metric standardization for Greece, 1920, translating the metric letters of the World Trade Club for distribution thruout that country. In a later chapter, "The Metric Movement Thruout Britannia," an outline is given of the co-ordinated effort of organizations in the British Isles,

Canada, Australia, New Zealand, United South Africa, India and other Britannic countries, to secure world metric standardization.

The organized metric movement in the United States of America has been surveyed in the present chapter, together with an indication of the worldwide trend toward the unification of measures everywhere. In this great progressive movement Americans have taken a leading part, and it is trusted that the testimony here presented shows conclusively that Organized Business in the United States of America is virtually unanimous in favor of the metric system of weights and measures. And organized effort to secure this great advance has come not alone from the commercial community, but from associations interested in every phase of human life. The nationwide and worldwide demand for metric standardization cannot be denied. Truly, the metric system is soon to achieve its "manifest destiny."

CHAPTER 7

THE WORLD METRIC STANDARDIZATION COUNCIL

THE organized effort in behalf of the decimal system has been co-ordinated by the World Metric Standardization Council. This organization is active in the advancement of metric legislation in the United States of America, the British Isles and all the British Commonwealths.

For a number of years the Council and its members have participated in the extensive educational metric campaign, in conjunction with others working in the same cause. As the result of its initiative, thousands of petitions are being sent to the United States Congress and the British Parliament urging gradual establishment of the metric units for exclusive use. The Council has conducted a news service for the benefit of world newspapers and magazines, and its dispatches telling of the progress of the metric standardization movement have been widely published. The leaflets bearing the imprint of the World Metric Standardization Council have emphasized the need for prompt adoption of the world system of weights and measures. One such leaflet, addressed to Manufacturers and Merchandisers, conveys the message of William C. Redfield (for 7 years United States Secretary of Commerce, and 2 times President of the American Manufacturers Export Association) urging that "we should adjust ourselves to the great world by making the advance to the metric standards."

The present volume is a compilation made under the direction of the World Metric Standardization Council, and is one more contribution to the cause of world uniformity for which it has steadfastly striven.

The Council is truly a world organization, with members and correspondents in virtually every country. In order to indicate the wide scope of the organization, the officers and advisory directors are here given:

Executive Representatives: **W. H. Hammer,** President; Hammer & Co., world merchants, San Francisco; **Howard Richards,** Secretary of the American Metric Association, 156 5th Avenue, New York City, United States of America; **W. Mortimer Crocker,** Congress Hall Hotel, Washington, D. C., United States of America;

G. E. M. Johnson, Honorary Secretary, Decimal Association, London, British Isles; **Harry Allcock,** M. I. E. E., Honorary Secretary, Manchester and District Decimal Association, Manchester, British Isles; **Leon Lorrain,** Secretary, Chamber of Commerce, Montreal, Canada. Executive Secretary of World Metric Standardization Council: **Aubrey Drury,** 681 Market Street, San Francisco, United States of America.

Advisory Committee for the United States of America: **Comfort A. Adams,** Consulting Engineer; President, American Institute of Electrical Engineers, 1918-19; **Raymond F. Bacon,** Director, Mellon Institute of Industrial Research, University of Pittsburgh, Pittsburgh, Pa.; **E. C. Bingham,** Lafayette College, Easton, Pa.; Chairman, Metric System Committee, American Chemical Society; **George P. Blow,** President, Western Clock Company, La Salle, Illinois; **Luther Burbank,** the world's greatest grower, Santa Rosa, California; **R. T. Crane, Jr.,** President, The Crane Company (Crane Valve Works), Chicago, Illinois; **Melvil Dewey,** President, National Efficiency Society; Trustee, Chautauqua Institution; Lake Placid Club, New York; **A. F. Du Pont,** President, Du Pont Food Products Company; President, Du Pont Overseas Trading Company, Baltimore, Maryland; **Fred R. Drake,** Drake & Company, wholesale grocers, Easton, Pa.; member, Metric Committee, Chamber of Commerce of the United States of America; **Charles Scribner Eaton,** Alderman, City of Chicago, Illinois; **Charles W. Eliot,** President Emeritus, Harvard University, Cambridge, Massachusetts; **Winfield S. Hall,** President, Child Conservation League of America; Northwestern University Medical School, Chicago, Illinois; **William E. Hague,** Builders Exchange, Oakland, California; **Albert Herbert,** manufacturer; Chairman, Standardization Committee, U. S. American Delegation, International Chamber of Commerce (Paris, France, 1920); **Edward V. Huntington,** Professor of Mechanics, Harvard University, Cambridge, Massachusetts; **Thomas Howard,** Executive Chairman, National Institute of Inventors, New York City; **Louis C. Karpinski,** Professor of Mathematics, University of Michigan, Ann Arbor, Michigan; **Arthur E. Kennelly,** Exchange Engineering Professor to France, 1922; Director, Electrical Engineering Research Division, Massachusetts Institute of Technology; Professor, Electrical Engineering, Harvard University; **George Frederick Kunz,** President, American Metric Association; Vice-President, "Tiffany's," New York, London and Paris; **Clancey M. Lewis,** Executive Secretary, Washington State Manufacturers Association, Seattle, Washing-

ton; President, The China Club; **Joseph F. Merrill,** Director, Schools of Mines and Engineering, University of Utah, Salt Lake City, Utah; **David A. Molitor,** Civil and Consulting Engineer, Detroit, Michigan; former Designing Engineer, Panama Canal; **William A. Noyes,** Urbana, Illinois; President, American Chemical Society, 1920; **William C. Redfield,** for 7 years United States Secretary of Commerce; 2 times President, American Manufacturers Export Association; **Zalmon G. Simmons,** President, The Simmons Company, manufacturers, Kenosha, Wisconsin; **Robert E. Swain,** Leland Stanford Junior University, Palo Alto, California; **George B. Vashon,** commercial publicity; President, League for Urban Improvement, St. Louis, Missouri; **Arthur P. Williams,** Chairman, Metric System Committee, National Wholesale Grocers Association, New York City, N. Y.

The Advisory Committee for the British Isles consists of the Directors of the Decimal Associations of London and Manchester, working thru the Executive Representatives, Harry Allcock and G. E. M. Johnson. Correspondents in Canada, Australia, New Zealand, Union of South Africa, India and many other countries are in constant communication with the central council. (See the chapter on "Metric Movement Thruout Britannia.")

Among the notable achievements of the World Metric Standardization Council has been the holding of one of the largest meetings ever convened in behalf of world uniformity of weights and measures. Because of the widespread interest and far-reaching effects attendant upon this gathering, it will be of value here to present a summary of the proceedings.

An Historic Conference

On the evening of 17 May, 1920, the World Metric Standardization Conference was held in the Palace Hotel, San Francisco. The assembly hall was crowded to overflowing by more than 500 persons, including delegates from a number of national organizations and great industrial concerns, as well as representatives from many countries of the world. Their national flags, displayed about the hall, added an attractive element of color to the gathering and typified its international character.

W. H. Hammer, President of the Metric Standardization Council and President of the World Trade Club, which has taken a leading part in the metric campaign, called the meeting to order. In welcoming the gathering, Mr. Hammer referred briefly to the notable progress being made by the metric movement. He expressed his gratification at having present many of the delegates from the National Foreign Trade Convention, which had just closed

a splendidly successful session in San Francisco, and welcomed also the consular officers of other governments who were in attendance.

Mr. Hammer introduced the chairman of the evening, John J. Arnold, Supervisor of the International Business Department of the Bank of Italy and a National Foreign Trade Councillor. Mr. Arnold spoke on "National Efficiency, World Unity and Metric Standardization." He said:

Address of John J. Arnold

"About the time when I came into the activities of business life, we had as our great slogan, 'Competition is the life of trade.' I think that today we feel that we have far passed that ideal in business and we are in the attitude of mind where we realize that co-operation is the life of trade.

"Co-operation, I am sure, was the life of our activities during the war. I don't know that we have any better demonstration or illustration of what co-operation can accomplish than the activities of our own industries co-operating with each other in our own nation.

"Then we have the activities of the various nations in co-operation with each other. In that co-operation we emphasize particularly the element of standardization. And why? Standardization in our industries was recognized as being the greatest step toward efficiency.

"We had, for instance, just in one particular industry, when the government required the manufacture of wagons for the purpose of war, vehicles of all kinds. We found that we had some 60 or 70 or 80 different standards of wagons and vehicles, in our country. And those who were in charge of that particular section brought the standardization of that industry down to the basis of 6, so that we have only 6 different kinds of wagons and vehicles, all for the one great purpose of efficiency, co-operation, standardization.

"And I believe that the one great aim of the movement in which we are interested is to bring about co-operation in international life in peace time as we have had it in time of war. Certainly if there is any one thing that we need at the present time to emphasize, it is the element of efficiency. By standardization of weights and measures thruout the world; by standardization of currency; by standardization of civilization, we will be moving toward the ideal of co-operation in international life, which, I believe, is the greatest weapon that we can possibly develop for the abolition of warfare.

"In this movement we want to take into consideration particularly the need of a language which we can all understand. That is one of the greatest difficulties in international life today. We do not understand each other. That does not mean only language of

tongue, but it means also language in the broader sense, in business and in commerce. While all of us are not in a position to learn all of the languages, we can centralize on a few things, and the standardization of weights and measures, to my mind, is one of the things on which the world ought to agree.

World Metric Standardization Inevitable

"I believe that we are in a movement which can not stop. It doesn't make any difference how much some of our great 100% Americans talk about restricting this nation to its activities within its boundaries, and that we are interested only in America first and all the time; it doesn't make any difference what such men may have as the basis for their argument. The fact is, and remains, the United States of America is today forced into the position of a world power and must participate in world activities. (Applause.)

"What we want is to simplify things, to systematize things. I am not satisfied simply with standardization of weights and measures thruout the world. I want to go further than that. I want to see a standardization of currency thruout the world. (Applause.)

"I want to see brought into movement before I leave the scene of action more complete standardization of civilization. We want no one dragged down, but we want to try to help to lift up those who are on a lower level; and in all this the great movement to standardize weights and measures is a big part.

"I trust that we shall go from this meeting with a determination to spread the gospel, to advocate more standardization of civilization and more standardization of language—in particular, standardization of the language with which we can speak to each other, even if we do not understand French and English or German or Russian or whatever it may be. Here is the metric language, in which we can speak to each other so that all may be made to understand."

Present at the Metric Conference were prominent representatives of the United States Army and Navy. Rear-Admiral J. L. Jayne, Commandant of the 12th Naval District, spoke on "Metric Standardization and the Navy." He said, in part:

Address of Rear-Admiral Jayne

"I speak for myself alone tonight, not for the Navy Department. Personally, I have believed in the adoption of the metric system for many years. I see no reason why we should not adopt it now. The navy would probably be as much affected by the advance as any industry or any group of industries in the world.

"Our ships are very complex mechanisms; almost all the industries are involved in the making of a ship, so that if this progress

were made it would apply to practically all the industries as far as the navy is concerned.

"You can readily see how if a universal standard were adopted it would be to the advantage of a ship requiring repairs in another country where the metric system is the standard. The chances of mistakes being made in repairs would be very much reduced if the machinery were on the metric system, the system in vogue where the repair work is to be done.

"You can readily see also that if the repairs were urgent and a radiogram were sent into the shop in question where the repairs were to be made, the chances of an error would be much less if the measures specified in the message were given in the world metric system.

"Of course there might be a temporary inconvenience in making the transition. I believe, however, that the navy should put up with that inconvenience in the interest of general advancement.

"The many measurements on the plan of a ship would have to be converted into the metric system, and it would be quite an undertaking to do that. Very few of our ships are built on the same lines. The machinery of most of them, except in groups of perhaps 4, is different. There is no group of the navy that I can think of where the number of ships exceeds 5 that are practically identical; and even those that are supposed to be "sister ships" are not identical in many respects. So there would be a great many changes which would have to be made in the plans of ships to convert the dimensions of the hulls and machinery from our present standards to the metric system. But as I have said before, I think we should put up with any inconvenience that would follow from the transition being made.

"I believe that it would be to the advantage of the navy in the end; and it is our duty to help out the advancement of science in the world by being willing to make the transition now."

Colonel Thomas H. Rees, Corps of Engineers, United States Army, was present at the conference, representing Lieutenant-General Hunter Liggett, commanding the Western Department. Colonel Rees gave an interesting address on "Metric Standardization and the Army." He also presented the following letter from General Liggett:

"I take great pleasure in indorsing your campaign for the adoption of a metric system in the United States. I believe it will be of as great benefit to the country as a whole, as I know it would be to the Army."

Lieutenant-Colonel Richard Derby, Aide-de-Camp to General Liggett, wrote: "General Liggett wishes you every success in your conference, and hopes that you will attain your object of introducing the Metric System into the United States."

In the course of his remarks, Colonel Rees said:

Address of Colonel Rees

"Although designated in place of General Liggett, and in his absence to represent the Army at this conference, I have no right to claim that my remarks will express any formulated consensus of opinion in Army circles on the subject before us. However, army officers are mostly reasonable and intelligent men and I have yet to find any reasonable and intelligent man, who has given this matter some consideration and study, that is not heartily in favor of the adoption of a decimal system.

"The interest and importance of this question to the Army are the same as they are to other professions, industries, trades or activities and are measured simply by the number of persons involved and by the occasions which arise for the use of weights and measures. The problem is basic and fundamental and enters into every phase of life whether it be commercial, industrial, social, economic, domestic, scientific or military. Army activities involve practically all professions, all sciences and all trades and the Army's interest is therefore as wide as that of the nation.

"At school we were taught that arithmetic is the science of numbers and the art of computation, and we were instructed in the Arabic or decimal system of notation. We began with abstract numbers, and altho the process was somewhat laborious we finally acquired some knowledge of this science and art and learned the significance of position in determining the value of figures with the constant ratio of 10 between adjacent places. Finally we came to concrete numbers; numbers with names; numbers that expressed values, dimensions and quantities; numbers that meant something and that would be of daily use thruout our lives.

"And what happened? We abandoned the science so laboriously acquired; we discarded the art that we had learned to practice and we had to begin all over again with a new system that was not a system but a heterogeneous jumble of new relations and ratios, none of which, with one exception, happened to be 10. The only friend we found in this labyrinth of relations was the table of coinage which we didn't have to learn, because it was the familiar decimal system that we had been using.

"The new ratios that we had to use, not shown by position but applied by the arduous processes of multiplication and division, are, for example, 2, 3, 4, 5½, 6, 7.92, 8, 9, 12, 16, 16½, 20, 24, 27, 27.34375

(Gr.=1 dr. Av.), 28, 40, 66, 112, and so on indefinitely—all these instead of the one simple ratio of 10 indicated by position. We found also that we cannot express exactly by our decimal system of notation an inch as a part of a foot (.0833+), a foot as a part of a yard (.3333+), a yard as part of a mile (.000568181+), etc. The side of a square acre cannot be expressed exactly in terms of feet (208.71032+), or yards (69.570106+). A square mile or section of land cannot be divided up into square acres. The edge of a cube that contains a pint, quart, gallon, peck or bushel cannot be expressed exactly in terms of inches.

"There is no rule or principle connecting the innumerable denominations of our present system. The value of each and every denomination is an independent, arbitrary, isolated, accidental fact that must be separately memorized. I know of no one who has been able to do it.

"With all these difficulties and absurdities we still adhere to this ancient system. The advance from the Roman system of notation with its I, V, X, L, C, D and M, to the Arabic or decimal system was no greater than is the advance from the British system of measures to the decimal system of measures.

"Sir William Thomson (Lord Kelvin), the great English scientist, said in 1884, 'I look upon our English system as a wickedly brain-destroying piece of bondage under which we suffer. I say this seriously. I do not think anyone knows how seriously I speak of it.'

"I think we must agree with him; and I will close by asking this question, 'Having a universal decimal system of notation, why in the name of common sense don't we use it?' "

Howard Richards, of New York, Secretary of the American Metric Association, delivered an address on "The Metric Advance."

Address of Howard Richards

"It is indeed a pleasure to come some 5,000 kilometers, or 3,000 miles, to meet with others who are urging the advance of metric standardization.

"Let me explain to you one of my motives in advocating the general use of meters for measuring length; liters for measuring liquids or capacity; and grams for measuring weight. In the first place, these units are related to each other. I hold in my hand a cubic centimeter. This little cube is one centimeter on each edge. The cube is used as a unit for all chemical work and scientific work thruout the world, and any one in any part of the world who really is anxious to know how to do things and has gone to the bottom of things, has found out from practical experience what the cubic centimeter is.

"It is the smallest unit of capacity used by the 'prayer book and bible' of druggists and pharmacists, thruout the world. Please try it and learn for yourselves that the chemists have been well informed in adopting the simple decimal system of weights and of measures.

"From this measure of length has also been derived the measure of weight. This same cubic centimeter of water weighs one gram. The choice of water was made because it is the same in all parts of the world. It is used more extensively now than it was last year (laughter)—another argument for using the metric system. However, the people who use the cubic centimeter find that the weight of all substances is related to water.

"When new, the U. S. 5-cent piece is exactly 5 grams in weight; the 10-cent piece is half that amount, so that 2 dimes or a 5-cent piece weigh 5 grams. The coins of the world now, with a few exceptions, can be conveniently used as weights for any balance.

"Now these units are related to each other so conveniently that when one cubic centimeter of a substance such as iron, is known, iron weighing 8 times as much as water, has a specific gravity of 8. Instantly you can know the weight of one cubic centimeter of it. In the metric system if you know the specific gravity you know its density.

"People who have not been up against the practical problem of making things cannot realize the tremendous advantage metric units give. By considering the simplicity of adding and subtracting in dollars and cents, you can appreciate something of the saving in the common work of every day, which is best done in the world metric weights and measures. Who would be willing to be fettered with the pounds, shillings and pence of our ancestors?

"Joseph V. Collins, Professor of Mathematics, State Normal School, Wisconsin, says that every year the United States of America expends $315,000,000 to teach our children the present weights and measures, and after that we turn them out to attempt to work and compete with other nations using the simple metric units.

"Consider the position of an American salesman when he leaves the English-speaking countries. He says, for instance, that with certain treatment the International Harvester Company can produce so many bushels per acre; the prospective purchaser tries to figure on that basis—and goes and gets a metric machine.

"So the advance which has been found so easy to obtain in other parts of the world, and which is absolutely demanded in world trade, is an advance to the more convenient measurements.

Letter from Dr. George Frederick Kunz

"I will now read a statement from one of the men who has led the metric cause for 30 years and who is just now in his later years seeing the victory come; and he has urged me to pass on to you this torch that he has waved so strongly and so well. George Frederick Kunz, president of the American Metric Association, vice-president of Tiffany's, and the world's greatest gem expert, writing from New York City, 10 May, 1920, says:

"'In my opinion, the metric, or meter-liter-gram campaign of the World Trade Club is the most effective and public-spirited service that has been rendered in the field of weights and measures during the past 100 years.

"'In unity there is strength. We all unite in spreading the common use of meters for measuring lengths, liters for measuring liquids, and grams for defining weight. They are at once the easiest standards to learn and the best to work with. It is therefore a subject of congratulation that the metric movement is now fortunately making good progress along every front.

"'In this connection I desire to express our satisfaction over the modern practice of marking in grams the weight of materials enclosed in containers, more especially of food products put in cans or packages, and also concerning the growing custom of assembling such containers in groups of 10s, or multiples of 10.'"

R. E. Swain, of Leland Stanford Jr. University, officially represented at the conference the American Chemical Society, an organization with 16,000 members, which has consistently advocated the metric advance. Mr. Swain, as President of the California section of this society, spoke in an authoritative manner concerning "The Metric System and the Chemical Industry."

Address of R. E. Swain

"To a chemist it seems very much like debating the self-evident to enter upon a discussion of the wisdom of adopting the metric system of weights and measures, and I think, Mr. Chairman, that I can say to this assemblage, that there is not a single member of the powerful American Chemical Society that would not heartily and even enthusiastically stand behind any movement which has for its purpose the adoption of the metric system; and incidentally the relegation to the obscurity which it deserves, of our absurd national system of weights and measures.

"Our present system could never become the basis for scientific investigation; that is perfectly evident to the chemist and physicist. If he had this thrust upon him he would have a millstone around his

neck. You have had some of the peculiarities of this grossly unscientific system placed before you.

"I will not take time to dwell longer upon the subject, but the fact remains that we have no proper relationship between weight and volume; that we have not one system of magnitude but 2 or 3, the inter-relationships between which we ourselves do not comprehend.

"Then turning to the other phase and that is the more practical one: The chemical industry in this country is rapidly expanding. It is entering upon a new era and that is the era of participation in world trade. Right there the chemical industry is experiencing a barrier to its progress, because of the isolation of our country with its present weights and measures.

"I think most of us chemists understand that a good deal of the commercial advantage of Germany, France and Holland and other metric countries, invading the British commercial supremacy, was because of the fact that the metric nations spoke a common language with nearly all the civilized countries of the world—with practically all except what we call the English-speaking nations, which alone stood apart.

"We can't send a man or nation into the market place, speaking a language unintelligible to the customers, and expect success. That is one of the experiences in connection with the promotion of world trade, and we all recognize the importance of it. So when we look at this growing list of chemical products, taking the place of the cargoes of raw materials which we sent formerly to manufacturing nations there to be made into finished products and sent over traffic lanes to other nations—we see that we are now sending our own finished products, our dyes, our chemicals, our glucose, our synthetic drugs, and so on, directly in competition with the other trading nations of the globe.

"We must preserve every possible advantage in this connection. We must not be forced to face the handicap of a discordant system of weights and measures such as ours."

The Secretary of the Washington State Manufacturers' Association, Clancey M. Lewis of Seattle, spoke on "Manufacturers and Metric Standardization." This organization took a referendum among its members and found that the sentiment for the adoption of the metric system was 2 to 1 among manufacturers in that part of the United States of America.

Address of Clancey M. Lewis

"I feel very much complimented this evening, judging from the nature of this subject, that I am asked to speak in behalf of the manufacturers. It would be presumptuous on my part to speak for the manufacturers

of the United States when I represent only those of the State of Washington. I think, however, if you will look at your program here this evening you will find that the manufacturers of the United States of America have spoken for themselves. They are with very few and rare exceptions in favor of the metric system.

"We are now on the eve of real industrial expansion in the State of Washington. We have begun to realize the value of standardization in measuring the quantity of products. We want to be prepared to meet requirements of world markets with efficiency; and we believe the first step is the adoption of the decimal metric system, by the United States of America.

"I have been thinking—and this may not be in accord with some of my confreres—but the suggestion has come to me that perhaps as a nationality we might preserve our individuality by clinging to our present nomenclature, but using the decimal metric values. We find today in discussing the question of exchange, that it is very convenient to know that the mark represents Germany, the pound sterling, England; the franc, France, and the dollar, the United States.

"I want to pay a tribute to the World Trade Club of San Francisco. I say, all hail, Mr. Hammer, to the World Trade Club of San Francisco. It has focussed the attention of industrial America upon the Pacific Coast.

"It has turned the eyes of commerce to the Golden Gate. It is as a 'voice of one crying in the wilderness' of weights and measures, in the fulfillment of the prophecy of our great statesman and metric champion, Seward, that the theatre of the world's great events will be on the Pacific. Gentlemen, you have started something and we in Washington will help you finish it." (Applause.)

How the great Goodyear factory at Los Angeles is to operate entirely under the metric system was told by Burgess Darrow, Chief of the Technical Division of the Goodyear Tire & Rubber Company of Akron, Ohio.

Address of Burgess Darrow

"As a representative of the Goodyear Tire & Rubber Company and as one of the speakers here tonight, it makes me feel more or less like the little boy who made his first trip to the dentist. He talked all the way down town—and after the operation was over he was ashamed of himself for making all the fuss.

"Well, the Goodyear Tire & Rubber Company argued quite a lot about the metric system until we finally adopted it. Now as we look back on it we wonder why we didn't adopt it long ago.

"It must bring pleasure to those who have advocated the system for the last few years to know that a concern the size of the Good-

year plant, employing about 40,000 men, has finally decided to adopt the metric system.

"Before adopting the system we gave serious consideration to the advantages and disadvantages concerning the Goodyear plants. The advantages were 1st, the saving in time on the part of all who had to do with weights and measures in the factory—executives, engineers, foremen, clerks, inspectors, workers and operators; 2nd, the reduction in the number of errors on the part of the same people; 3rd, it gave to the Goodyear company a universal system for all its plants, whether they were in America or in other countries, which brought about a better co-operation among all the plants (just as this system will bring about a better co-operation among nations), and it permitted a more ready interchange of personnel.

"The disadvantages were, 1st, the training of a large number of men in the use of the metric units; 2nd, the convincing of a great number of other concerns which the Goodyear company depends upon for material, to work to metric specifications.

"It was seen that the advantages were considerable and the disadvantages were not serious. The 1st disadvantage, that of training a large number of men, has already been overcome. The 2nd disadvantage, that of convincing the outside concerns to work to metric specifications, is something which does not affect the internal workings of the Goodyear company. Just how long it will be before we can insist on other concerns furnishing us material to metric specifications, I do not know.

"It was about 3 years ago (1917), when the adoption of metrics took definite shape with the Goodyear company. Those units were at once installed in the solid motor truck tire department, which employed at that time about 200 men.

"During the war we were unable to carry the system any further in our plants, but since the war it has been possible to obtain instruments and a number of other departments have already changed. I expect within 12 months the entire Akron plant will be operating on the metric system.

"The Los Angeles plant, which will employ about 5,000 men, is equipped entirely in the metric system, even going so far as to use Centigrade thermometers.

"Our laboratory at Akron has been operating on the metric system for about a year (since 1919) and all its daily routing tests are given quite wide circulation among the foremen and inspectors. They have no difficulty whatever in understanding the units in which the results are expressed.

Aids to Metric Use

"I would like to take a little time to tell you some things which I think will have to be brought about before the metric system will be universally used in the United States.

"1st, I think that it must be taught thoroly in all grades of school, not in addition to the English system, but given fully as much time as the English system is given.

"2nd, the huge armies of industrial workers must be taught the metric system—and they will be, as more and more industrial plants adopt that system.

"3rd, some means must be provided to introduce metric weights and measures into the handling of the ordinary household commodities.

"The commercial reason for putting metric marking on tires was that we felt we could increase the sales of American-made tires if they went to other countries with a metric marking.

"It won't do any harm the next time any of you order tires to look at the metric marking on the tires and ask for that size, and thus get the salesmen educated.

"In closing, I have one message to the men here who represent manufacturers. It seems to me that it is a good plan when you know that something has to be done, to do it quickly. The Goodyear Tire & Rubber Company saw that they had to advance to the metric system eventually and they would rather go about it now, more or less at their leisure, instead of having to make the advance some time when it would cause more trouble.

"There is probably one other slight reason why they adopted metric units; and that is, they don't very often overlook any chance to improve the efficiency of their plant. They figured out just what saving metric standardization means in dollars and cents."

Remarks of Sir Frank Popham Young

At the World Metric Conference there was presented a symposium of opinion supporting the metric system, statements having been sent in from all parts of the world. The message for the British commonwealths was written by Harry Allcock, M. I. E. E., honorary secretary of the Decimal Association, Manchester, British Isles. Mr. Allcock is also a member of the Executive Committee of the London Decimal Association. His address was read by Lieutenant-Colonel Sir Frank Popham Young, formerly British commissioner in the Punjab, India. In his introductory remarks, he said:

"As your chairman has informed you, I am but the mouthpiece of another, to deliver to you a message from the country of my own origin.

"Since I have been in America, I have heard a great deal about that person who is described as the '100% American.' Personally, I don't think I have met any other variety, except one who may be described as the 99.9 recurring American. Of course there is the 200% Californian. (Laughter.) Well, even the most completely rounded 100% American will, I trust, admit that there are certain institutions which America has inherited from Britain which have been worth while. (Applause.)

"As a Britisher I am bound to admit that Britain has sorely hampered you by this terrible system or want of system, by which you have been so fettered, due to your associations with my country in the past."

Address of Harry Allcock, M. I. E. E.

"During the war, manufacturing resources of America and Britain were enormously increased to meet the imperative demand for munitions of all kinds.

"Both nations have now to find a solution of the pressing problem of how to increase to a corresponding extent the world's demand for their peace-time products in order to keep all this additional plant fully engaged and so provide continuity of employment for their demobilized fighting men.

"This necessity to broaden the basis of the world's demand will become still more marked after the accumulated requirements of the home markets have been reasonably met.

"In the meantime the progressive manufacturers of both nations are seeking ways and means of establishing a closer contact with their potential overseas customers; and we may accordingly expect the keenest friendly rivalry will be displayed thruout the whole arena of the world's markets.

"When rival suppliers are seeking the goodwill of the same consumer it is obvious that, other things being equal, the one who presents his offer in the manner most readily understood by the prospective client is the more likely to secure the business. Hence the present great activity on the part of our respective Governments and of various private trading organizations as is evidenced by their despatch of commercial ambassadors to all parts of the world, charged with the duty of studying the conditions on the spot for the guidance of the manufacturers at home.

"Diversity of language is one of the first difficulties to be encountered; and this is not surprising considering that it is said there are about 265 different spoken languages still in active use. To this fact must be attributed the efforts now being made in some quarters to establish an artificial universal language, such as 'Esperanto,' 'Ido,' and so on, whereby the commerce of the world

may be the more readily conducted. Beyond remarking that any such attempt has enormous difficulties to surmount—if only for the reason that an idiom is frequently unintelligible when translated from its native tongue—this is not the occasion to discuss the merits of these rival proposals.

"If, however, we narrow down this language question to a consideration of the various methods of expressing quantities, we find that world trade is very largely expressed in one of 2 systems: 1, the British unstandardized weights and measures; 2, the world metric standard units. Ought we not to try to establish the universal standard for our language of quantity?

Only Rescue from Dual Confusion

"Without attempting to reiterate the well-known arguments in favor of the metric system, it may be simply noted that metric weights and measures have made such great progress that they are already known and partially used by the majority of the overseas traders of all nations. So great, in fact, has this progress been that, in any attempt to establish a universal language of quantity, we have to admit that the choice is no longer a simple one as between the British and the metric system, but is now a combination of the British and metric on the one hand and the metric system solely on the other hand. To put it differently, our present choice lies between the perpetuation of a dual system and the retention of a single system.

"Under existing arrangements, American and British manufacturers receive world inquiries expressed in metric terms, which they convert to British terms when preparing their estimates and reconvert to metric terms when presenting their tenders. (Some manufacturers omit the latter step and then complain that they cannot secure world business.)

"Whether they like it or not, American and British manufacturers for export are obliged to use the metric system in a progressively increasing portion of their business; and they have no escape from the obligation to employ 2 systems other than by the abandonment of the British weights and measures, which can never become universal by reason of manifest defects.

"Large world traders wherever domiciled must employ the world language, the metric system, as, in so doing, they will save time, eliminate errors and bring about a greater intimacy of contact on the one hand between the designer and the producer, and on the other hand between the producer and the consumer. The designer at home, and the consumer overseas already largely employ metric weights and measures; and it only remains for the producer to fall into line.

No Scrapping of Existing Plants

"Opponents of the advance argue that British and American adoption of the metric system would involve costly scrapping of existing plants. They say that the obligation to supply spare parts and renewals of machinery made to English measurements prevents present adoption of metric weights and measures.

"These fears are groundless and are based on the unwarrantable assumption that an alteration of dimensions would be involved, whereas only a revised description of the existing dimensions is required.

"Metric equivalents expressed even so approximately as to the nearest whole millimeter could not differ from the original British dimensions by more than 1/50th part of an inch (which is sufficiently near for the great majority of dimensions); and for close work, such as in bearings and the like, equivalents to the nearest 1/100th part of a millimeter would specify a degree of precision very rarely attained in actual manufacture (maximum variation 0.0002 inch).

"We may thus ignore the suggestion of the alarmist that it would be necessary to provide a long string of figures after the decimal point in order to quote the metric equivalents of British dimensions. An expression in millimeters with 2 figures after the decimal point cannot be more confusing than inches with the 3 figures after the decimal point to which engineers have long been accustomed.

"Prejudice is the chief obstacle to be overcome; and as practical men we have to consider the best method of shortening the period of the present wasteful use of 2 systems where one would be infinitely better in every way.

Steps in the Metric Advance

"There appear to be 3 steps: 1, to legalize the use of the metric system; 2, to encourage the use of the metric system; 3, to provide for exclusive use of the metric system.

"The first step has already been taken by the American and British governments; and many world traders in both countries now urge that the time is ripe for exclusive use. In any case, the arguments are overwhelming in favor of a preparatory course of active encouragement by our respective governments in lieu of their present policy of passive permission.

"Such encouragement might, for instance, take the form of an instruction that all quantities in specifications issued by government departments must be expressed primarily in metric terms—the British equivalents being added, for a period, if thought fit.

"The 2 governments might also mutually agree to proclaim that it is their intention to establish the metric system as the sole language of quantity at some future date. Such an announcement would encourage manufacturers to change over to the new system in a manner and at a time most convenient to themselves.

"Having this indication of the government's intentions, the manufacturers could assist the movement and themselves by arranging for the following:

"1. Express all cataloged dimensions in metric terms—the British equivalents being added if thought fit.

"2. Alter no existing design merely for the sake of rounding off the metric equivalents of the British dimensions now in use. (State general dimensions to the nearest whole millimeter. Give dimensions of bearings and the like to the nearest 1/100th part of a millimeter.)

"3. In so far as the producer can legitimately influence the consumer, encourage the consumer to specify listed metric sizes.

Workshops to Work to Own Measures

"While every effort would be made to conduct all buying and selling in terms of the metric system, no undue pressure should be applied to secure the sole use of metric weights and measures inside workshops. For years a portion of their output manufactured to British dimensions has been sold in metric terms; and there would be no necessity to alter existing workshop nomenclature until goods under metric description were commonly bought and sold in the British markets as well as in world markets. In the meantime, the growth of the use of limit gages will greatly simplify the ultimate substitution of metric dimensions in manufacturing processes; and earlier prejudices are already rapidly disappearing as a result of the war's educational influences.

"Whether the honor of leading the way in this important advance rests with America or Britain, it would appear certain that **the other must rapidly follow.** Failing joint action being arranged, I expect America will take the initiative because she has already accomplished an essential step in the metric direction by her adoption of decimal coinage; and her energetic determination to become an exporting nation in the widest sense will probably make her less tolerant of hampering influences. Sentimental objections to the suggested abandonment of the British weights and measures are also likely to have less weight in America than in Britain.

"I hope the World Metric Standardization Council will continue its laudable efforts to simplify the means of communication between the designers, the producers and the consumers of the whole world."

Sir Frank Popham Young added, after reading Mr. Allcock's address, "I think, ladies and gentlemen, that there is not the slightest shadow of a doubt that America will have to lead the way in this great advance. It will take a very big jolt to get Britain out of the rut, and I hope America will supply that jolt." (Applause.)

Roll Call of the Nations

After the addresses had been presented, there was held a "Roll Call of the Nations." Two messages from France were read by Gaston Giraud, representing the French consulate, and commercial attaché in the United States for French Indo-China. These messages, from **Marshal Joffre** and **Marshal Petain,** are printed elsewhere in this volume. Other statements were read by the secretary, Aubrey Drury, showing the worldwide support of the metric movement. Virtually every country was represented in this symposium. One particularly strong expression of support was sent to the conference from the International Red Cross, Geneva, Switzerland.

Another part of the program of the evening which was greeted enthusiastically by those in attendance was the presentation of statements from pre-eminent Americans urging world metric standardization. These messages of support were flashed upon a stereopticon screen, together with portraits of these advocates of the metric movement. Among those quoted were Thomas A. Edison, Luther Burbank, Henry Ford, Franklin K. Lane, William C. Redfield, General John J. Pershing, General Leonard Wood, William G. McAdoo, Samuel Gompers, Arthur E. Kennelly, David P. Barrows, William B. Wilson, Julius Kahn, General W. C. Gorgas, Newton D. Baker, Franklin D. Roosevelt, Otto H. Kahn, Alexander Graham Bell, Charles W. Eliot and J. W. Alexander, U. S. Secretary of Commerce.

The Secretary of the meeting also read statements from industrial concerns, typical of those urging the metric advance, including the Truscon Steel Co., Du Pont Food Products Co., Illinois Smelting and Refining Co., American Wire Fabrics Co., Crane Valve Works and National Mosaic Tile Co. Industrial leaders quoted included S. W. Vauclain, President, Baldwin Locomotive Works; Elwood Haynes, President, Haynes Automobile Co.; F. O. Wells, for 20 years President of the Greenfield (Mass.) Tap, Die, Machine Tool Co.; and George W. Perkins, United States Steel Corporation.

Unanimous Vote for Metrics

At the conclusion of the metric symposium, a discussion of various standardization issues was held, the audience participating. Then James G. Decatur, commercial agent of the Western Union Telegraph Company, arose and presented a metric resolution, which was promptly

seconded and carried unanimously by this concourse of 500 people. The resolution is as follows:

"Resolved, That the World Metric Standardization Conference assembled in San Francisco, urges the gradual adoption of the metric units of weights and measures as the exclusive legal standard within the jurisdiction of the United States of America and the British Commonwealths.

"Resolved, That the Congress of the United States of America is hereby respectfully urged to make the metric units the exclusive legal standards after a reasonable transition period, providing at the same time for legislation that no manufacturer, owner of tools or other citizen, be handicapped by the transition, to the end that this advance benefit all and injure none."

An interesting feature of the World Metric Standardization Conference was the announcement of the winner of the prize of $1000 for the best word expressing "The United States of America and Britannia." The winner was Mrs. D. L. Stephens, 1415 26th Street, Bakersfield, California. She was the first person suggesting the word UNITANNIA—"the one best simple, useable, workable word denoting the United States of America and Britannia." As a result of the decision of the judges, she was mailed certified check for $1000.

This word-contest was open to all humankind. More than 75,000 individuals participated, sending in altogether more than 125,000 suggested words to the World Trade Club. Among the other name-words received, besides the winning UNITANNIA, were Freedomia, Concordia, Brusa, Amerbrita, Brit-Am, Gregadia, Pananglo, Usannia, Sam-Bull, Alsax, Unionia, Albrit, Inglophonia, Angloparlia, Unimericania, Bucantu, Englitox, Johnsam, Auk, Loneagle, Yankannia, Unikin, Unitaria, and thousands of others. Every country in the world was represented in this contest to secure the one best name for the United States of America and Britannia, the only 2 countries which have not yet advanced to the world uniform system of weights and measures. In sending in their suggestions, thousands at the same time expressed their desire to aid these great peoples to progress to world metric standardization also.

Among the organizations represented by delegates at the World Metric Standardization Conference were the American Metric Association, National Institute of Inventors, American Institute of Architects, National Wholesale Grocers Association, New York State Wholesale Grocers Association, National Wholesale Druggists Association, American Chemical Society, American Institute of Chemical Engineers, American Association of Military Engineers, American Association for the Advancement of Science,

Holland American Chamber of Commerce, Washington State Manufacturers Association, London and Manchester Decimal Associations (British Isles), Los Angeles Chamber of Commerce, World Trade Club of San Francisco (Foreign Trade Club), International 100% Club, California Esperanto Society, Universal Esperanto Association, Pacific Coast Numismatic Society, Berkeley Chamber of Commerce and many other organizations.

It is impossible to name here all those in attendance, but a few names will indicate the representative character of the assemblage:

Otto R. Lunn, Consul of Denmark; Arthur Brand, Consul of Spain; Florian Cajori, eminent author of "History of Mathematics"; C. M. Harris, President, San Francisco Public Weighers Association ("heartily in favor of metric advance"); Gino Borghesio, Italian Chamber of Commerce; Jules Simon, Consul of Belgium; Henry Colombat, French Hospital Society; Antonio Cuyas, representing the Spanish Embassy in the United States of America, Washington, D. C.; J. M. Dodd, representing United States Federal Board for Vocational Education; John L. Flynn, United States Internal Revenue Service; F. A. Gosse, representing Vancouver Board of Trade, Vancouver, B. C.; G. I. Kinney, International General Electric Company; Nathaniel R. Kuhn, representing Kilbourne & Clark Manufacturing Company, radio engineers; John D. Hynes, Supervisor, City Hall, San Francisco; A. W. Fisher, representing Hyatt Roller Bearing Co.; Edward A. Bertram, with Engineering Department, Southern Pacific Company, member Society of Terminal Engineers; F. M. Franklin, American Kron Scale Company; H. N. Thomas, China Mail Steamship Company; E. G. Babbitt, United States Bureau of Foreign and Domestic Commerce; E. J. Lea, California State Bureau of Foods and Drugs; Edward A. LeRoy, Jr., 1 Hanover Square, New York City, representing the National Foreign Trade Council; William C. Mackintosh, Secretary, California Camera Club ("heartily endorse movement"); Captain Henry F. McFeely, U. S. Army, Fort McDowell, California; J. R. Sargent, Topeka, Kansas, representing Indiana Limestone Quarrymen's Association, Bedford, Indiana; Sylvain Schnaittacher, representing American Institute of Architects; H. W. Morton, representing Traung Label Company and American Carton Company; R. S. Silva, General Steamship Corporation; Blakely Smith, representing the Houston (Texas) Chamber of Commerce and the Blakely Smith Company; Lawrence N. Wagner, Hong Kong, China; Major E. L. Wemple, Medical Corps, U. S. Army; Captain E. V. Sheafe, Medical Corps, U. S. Army; Major Edgar H. Brown, Medical Corps, U. S. Army (who said, "I know of nothing that would benefit the United States as much as the adoption of the metric system"); A. L. Vinzent, officially representing the Universal Esperanto Association, Bern, Switzerland (who said, "The Esperantists of the world favor this movement"); Mme. Marie Light-Plisé, member of International Sunshine Society and International Kindergarten Union (who signed, "Yours for a united world: one measure, and a universal analyzing language"); F. W. Heathcote, Bank of Italy (who said, "There is no room for argument"); Joel A. Hayes, Inspector of Steel Ship Construction, United States Shipping Board, and A. J. Frey, District Manager, United States Shipping Board (who both sent compliments to Colonel Thomas H. Rees for his address, and commented,

"The world understanding the world"); Boris W. Milovich, Commercial Attaché of the Russian Consulate in San Francisco; Ling Lew, representing the Chinese Student Christian Association in North America; Thomas W. Firby, representing Persia; Edmond O'Neill, representing American Institute of Chemical Engineers; S. Young, representing American Chemical Society; C. A. Pihl, representing National Institute of Inventors; C. F. Michaels, representing National Wholesale Druggists Association.

Shau Min Chang, University of California, representing at the conference the Chinese Students Alliance in the United States of America, wrote: "We are glad to help to push on this movement thru service of our 2 publications, 'The Chinese Students' Monthly' (English) and 'The Chinese Students' Quarterly' (Chinese)." F. W. Epley, D. D. S., of the Department of Radiography, University of California Dental College, declared: "In educational work I have taught this system to thousands of young people. I can teach it in a few minutes, to a class." G. W. de la Motte, representing Pacific Wassermann Laboratories, San Francisco, said: "We use and strongly recommend the metric system." Oliver Dwight Filley, member, American Society of Civil Engineers, said: "Obstacles found to be more imaginary than real by me in 15 years' use of the metric system in practical engineering work in Cuba and the Philippines. My engineering instruments are all graduated in the metric system." Major H. A. Kluegel, United States Army, member, American Society of Civil Engineers, and representing the Construction Division of the Army, declared: "Objections to making the effort to change to the metric system seem to come largely from a group of people least affected thereby. Let us have it." Eskild Jensen, mechanical and electrical engineer, remarked at the conference: "Even if the whole world used our present system, I would be greatly in favor of the adoption of the metric system as soon as possible."

World Traders Vote for Metrics

The World Metric Standardization Conference was held in San Francisco immediately following the great National Foreign Trade Convention, 1920, and many delegates who had come to that convention from all parts of the world remained to participate in the standardization meeting. In order to ascertain the opinion of world traders on the subject of gradual metric standardization, a post card poll of all delegates to the National Foreign Trade Convention was held, under the direction of the World Metric Standardization Council. John J. Arnold, Chairman of the conference, announced the result of this vote before the meeting:

In favor of gradual metric standardization, 371. Opposed, 10.

Mr. Arnold, after reading this vote, declared: "Thus we see it conclusively proved that world traders, and all the world industrial concerns represented in this great Foreign Trade Convention, are virtually unanimous in favor of the metric system."

Among the delegates to the National Foreign Trade Convention who expressed themselves as urging the metric units for exclusive

use (and many of whom attended the Metric Conference) were the following:

Irving Lindberg, Deputy Collector of Customs and Auditor, Republic of Nicaragua, Managua, Nicaragua; T. J. Wolff, representing the Government of the Philippine Islands; Marius de Brabant, Vice-President, Los Angeles Pacific Navigation Company, Los Angeles, California; C. W. Whittemore, for the Chamber of Commerce of the United States of America in the Argentine, Buenos Aires; A. R. Hager, Chairman, American Chamber of Commerce, Shanghai, China, and China representative International Multigraph Sales Company, and International Correspondence Schools; Shirla H. Blalock, District Office Manager, U. S. Bureau of Foreign and Domestic Commerce, Seattle, Washington; William C. Redfield, President, American Russian Chamber of Commerce, New York City (for 7 years United States Secretary of Commerce; and 2 times President, American Manufacturers Export Association); S. S. Marshall, representing China-Mongolia Export Company, and American Chamber of Commerce of Shanghai, China; A. N. Rolland, W. R. Grace & Co., San Francisco; Owen N. Jones, Manager, E. I. du Pont de Nemours Export Co., San Francisco; George S. Williams, for the Robert Dollar Company; H. E. A. Railton, Auditor and Assistant Secretary, Pacific Mail Steamship Co.; George S. Albaugh, manufacturer, Chicago, Illinois (Member, Metric System Committee, Illinois Manufacturers Association); F. R. Eldridge, Jr., Chief of the Far Eastern (Asiatic) Division, United States Department of Commerce (who commented, "Our foreign trade growth depends upon standardization"); F. H. Daniels, Manager, Export Department, Goodyear Tire and Rubber Company, Akron, Ohio; Ian Armstrong, Balfour Guthrie & Company, San Francisco; M. Q. Fong, China Mail Steamship Company; Lucien A. Dussol, Manager, Foreign Department, Cornell Wood Products Company, Chicago, Illinois; George W. Bosstike, Consulting Engineer, Portland, Oregon; Seth Mann, Manager of Traffic Department, San Francisco Chamber of Commerce; A. B. Cutter, City Engineer, Everett, Washington; A. R. Gormully, Export Manager, Ajax Rubber Company, New York City; Joseph P. Mudd, Sales Manager, The Bahmann Iron Works, Dayton, Ohio; Edward L. Soule, President, Edward L. Soule Company (Steel), San Francisco; M. E. Swanstrom, Executive Committee, Seattle Real Estate Association, Seattle, Washington; Antonio Cuyas, Spanish Commercial Delegate, Washington, D. C.; Enrique Gil, representing Argentine-American Chamber of Commerce, New York City, and "La Nacion," Buenos Aires; Sergios Baron, for Colombia; Percy W. Rairden, Far Eastern Manager, United States Rubber Export Company, Batavia, Java; A. Tigler Wybrandi, Secretary-Treasurer, Holland-American Chamber of Commerce; R. L. Wilkinson, Assistant Manager, Wilkinson Counter Company, Salem, Massachusetts; H. W. Force, President, California Corrugated Culvert Company, West Berkeley, California; W. H. Dryden, representing Wood-Craft Company of St. Paul, Minnesota; George N. Black, Oregon Export and Import Company, Portland, Oregon; A. G. Cameron, Division Manager, Goodyear Tire and Rubber Company, Akron, Ohio; S. Hart Kennedy, Secretary, Kalamazoo Vegetable Parchment Company, Kalamazoo, Indiana; N. J. Blagen, President, Gray's Harbor Lumber Company, Portland, Oregon; Charles F. Hauss, representing Italian Chamber of Commerce (New York), and Vice-President, Mediterranean Trading Company; P. L. Guercken, Director of the Board, The Kolchuguin Brass and Copper

Rolling Mill Company in Moscow, Russia; Antonio Zucca, Treasurer, New York Fruit Exchange, Inc.; Luther A. Scott, Foreign Sales Manager, Certain-teed Products Corporation; A. Warner, Traffic Manager, San Francisco-Oakland Terminal Railway; O. H. Fischer, President, Union Gas Engine Company, Oakland, California; J. Bernard Frisbie, of National City Bank of New York (who wrote, "My endorsement is based upon 3 years' business experience with metrics in Argentina"); M. Hall McAllister, representing Otis McAllister & Company, San Francisco; Harry E. Holloday, Importer, Melbourne, Australia; Samuel C. Osborn, representing Samuel C. Osborn Manufacturing Company, Chicago, Illinois; Augustus Pollack, Balfour Guthrie & Company, Seattle, Washington; Elijah G. Poxson, Export Sales Manager, Dort Motor Car Company, Flint, Michigan; Arsenio N. Luz, representing Bureau of Commerce and Industry of the Philippine Islands, Manila, P. I.; M. Kagansky, Vice-President, Russian Club of Seattle, Washington; Robert Radford, Vice-President, Standard Steel Works Company, Philadelphia, Pa.; W. B. Hamilton, Custom House, San Francisco; Jerome Landfield, Executive Vice-President, American Russian Chamber of Commerce, New York City; J. C. Freeman, Manager, Export Department, Lyon & Healy, Chicago, Illinois; Tomas Arango, Consul of Colombia; H. K. Watanabe, Secretary, Japanese Chamber of Commerce, San Francisco; Leroy D. Walker, President, State Bank, Portland, Oregon; Sidney W. Wilcox, head of Department of Economics, University of Nevada, Reno, Nevada; Milton L. Schmidt, Director, American Division, Paris Marché Du Monde, 18 Rue Taitbout, Paris, France; A. Jannopoulos, Secretary and Treasurer, Shreve & Company, Jewelers, San Francisco; W. Claussen, Pacific Coast Coal Company, Seattle, Washington; P. H. Edlefsen, President, Edlefsen Fuel Company, Portland, Oregon; William Tomkins, Secretary, for San Diego Chamber of Commerce, San Diego, California; Lawrence N. Wagner, Hong Kong, China; Hans Madsen, President, Landmans National Bank of Kimballton, Iowa; William M. Powell, Dayton, Ohio; Horace D. Wells, Special Agent, Travelers Insurance Company, Chicago, Illinois; C. Zook Sutton, Vice-President, California Wire Cloth Company, Oakland, California; Standard Chemical Company, Tacoma, Washington; California Paint Company, by O. S. Orrick, President; General Machinery & Supply Company, by A. V. Gregory, Assistant Manager, Mexico; G. Amsinck & Company, by G. B. Caryl, Assistant Manager; Hammond Lumber Company, by A. B. Hammond, President; Union National Bank of Pasadena (California), by W. W. Allen, Manager Foreign Department; Bean Spray Pump Company, by W. R. Townsend, San Jose, California; Toyo Kisen Kaisha, by Manager, San Francisco; Western Mineral Products Company, Oakland, California; Independent Tire Company, by E. J. Vaught, San Francisco; General Steamship Company, by R. S. Silva, Traffic Manager; Hanlon Drydock and Shipbuilding Company, by D. K. Byers; Hind, Rolph & Company, by J. L. Mark, Manager, Import and Export Department; William O. Goodrich Company, Milwaukee, Wisconsin; and more than 250 others.

Great World Membership

At the World Metric Standardization Conference it was announced that all those who petition the Congress of the United States of America, or the British Parliament, or both, to bring about gradual establishment of the metric units thereby automatically become members of

the World Metric Standardization Council. These now number more than 103,000 organizations, concerns and individuals. More than 4000 have sent explicit notice of their enrollment to the headquarters of the World Metric Standardization Council, and have aided its worldwide work. Dues of this organization are voluntary.

Among those who have enrolled in the Council, outside of the United States of America, the following may be cited as typical:

R. B. Brinsmade, Mining Engineer, Ixmiquilpan, Hidalgo, Mexico; Charles F. Beach, Lawyer, 24 Boulevard des Capucines, Paris, France (See "Who's Who in America" and London "Who's Who"); Hendrik Christian Anderson, 3 Piazza del Popolo, Rome, Italy; Christiania Trading Company, Christiania, Norway; J. W. Shaw, General Secretary, Order of Druids (Friendly Society, with 172,000 members), 330 Oxford Road, Manchester, British Isles; Dr. Antoine Velleman, University of Geneva, Switzerland; Federal Manufacturing Company, Melbourne, Australia; Fischer & Company, Swiss organization of Importers and Exporters, Tangier, Morocco; J. Tufuoor, Gold Coast, Africa; Robert Whitcomb, International Banking Corporation, Panama, Republic of Panama; Henry R. Procter, Professor of the Leather Industries, Leeds; de V. Payen-Payne, 49 Nevern Square, London, British Isles (See British "Who's Who"); C. M. Osborne, Manager, Lloyd's Bank, Woking, British Isles; D. Venkayya, Merchant, Chirala, Madras Presidency, India; Wilson G. Smillie, M. D., Sao Paulo, Brazil; H. B. Selby, Managing Director, H. B. Selby & Co., Ltd., Importers and Makers of Apparatus, British Isles; Lax & Shaw, glass manufacturers, Albert Glass Works, Leeds, British Isles; Lambournes, Empire Works, Great Charles Street, Birmingham, British Isles; W. E. Hammerton, Captain, Royal Engineers, Burton House, Mill Hill, London, N.W. 7, British Isles; Brinds Proprietary, Ltd., Ballarat, Victoria, Australia; Society of Ladies, Kalamata, Greece (Mme. Riggas, Secretary); Alfred Hayes, M. A. Oxon., Principal of the Birmingham and Midland Institute, Birmingham, British Isles; Vice-Admiral A. E. A. Grant, The Elms, Sydenham Hill, S. E. 26, London, British Isles; S. Marshall, Secretary, Common Commercial Language Committee, London, British Isles; Lieutenant-General F. S. Iredell, Vernon Lodge, Preston Park, Brighton, British Isles; W. Jocelyn E. Dale, Consulting Electrical and Mechanical Engineer, Apartado 2593, Havana, Cuba; J. A. Hoggsette, National Paper & Type Company, Buenos Aires, Argentina; O. E. Ruck, Colonel British Army, retired, care Aberdovey Golf Club, Merioneth, North Wales, British Isles; William Livingston, Linen Manufacturer, 52 High Street, Lurgan, Ireland, British Isles; Louis Vuitton, 149 New Bond Street, London, British Isles; Howard Wall Limited, manufacturers of Weights and Measures, Hackney Road, London, E. 2, British Isles; Prakasto Kumar, 77/4 Dharamatola Street, Calcutta, India; The Austral Bronze Company, Ltd., by James C. McDowall, 264 Botany Road, Alexandria, Sydney, Australia; E. G. Acheson, Ltd., by J. G. Deringer, Secretary, 5 Chancery Lane, W.C. 2, London, British Isles; Carey Bros., Mullingar, Ireland, manufacturers of Agricultural Machinery, and Coachbuilders; P. B. Andrew, Manager, London Joint City and Midland Bank Limited, Sheffield, British Isles; A. Beaumont, Manchester, British Isles, manufacturer of Cotton Goods for Export; Bradford Piston Ring and Engineering Co., Ltd., Bradford, British Isles; F. Charles & Company, Iron and Steel

Merchants, King's Chambers, Angel Street, Sheffield, British Isles; The Coil Clutch Co. Ltd., Engineers, Phoenix Works, Johnstone, Scotland, British Isles; Onward Motor Works, Croydon, Surrey, British Isles; Societé d'Encouragement pour L'Industrie Nationale, Paris, France; Courtenay's Worcestershire Sauce Syndicate, Ltd., Worcester, British Isles; Cutler Hill Colour & Chemical Company, Manchester, British Isles; Robert Prémont, 114 Rue Marquette, Quebec, Canada; E. Crawshay-Williams, 16 Embankment Residences, Cheyne Walk, Chelsea, London, British Isles (who writes, "I am strongly in favor of standardization on the decimal system; and when a Member of Parliament urged this"); Western Canada Mining, Engineering and Contracting Company, Vancouver, B. C., Canada; Hon. George Fowlds, C. B. E., Recent Minister of Education, New Zealand, Auckland, N. Z.; Lieutenant-Colonel Walter E. Webb, British Army, retired, 157 Gleneldon Road, London, S. W., British Isles; Chamber of Commerce, Calgary, Alberta, Canada; Robert Wallace, Professor of Agriculture and Rural Economy, University of Edinburgh, Scotland, British Isles; Taylor's Typewriter Co., Ltd., 74 Chancery Lane, W. C. 2, London, British Isles; Standard Chemical Products Co., Ltd., 116 West Regent Street, Glasgow, Scotland, British Isles; Rochester Lamp Co., thru C. J. Spencer, 120 Church Street, Toronto, Canada; John Clausen, Banker, Mexico City, Mexico; Claude E. G. Sobey, National Bank of Australasia, Melbourne, Australia; R. M. Grant Sobey, Melbourne University, Melbourne, Australia; Charles A. Ahrens, Ltd., shoe manufacturers, Kitchener, Ontario, Canada; The King Paper Box Company, Maisonneuve, P. Q., Canada; United Drug Company, Toronto, Canada, by George A. Evans, Chief Chemist; Alexander Vachon, Professor, Laval University, Quebec, Canada; Union Bank of Canada, Pense, Saskatchewan, Canada; Peter Standiford, Faculty of Education, University of Toronto, Canada; J. Napoleon Parent, Accountant, 158 Crown Street, Quebec, Canada; National Cartage & Supply Co., Quebec, Canada; W. E. Metcalfe, M. D., Portage La Prairie, Manitoba, Canada; James Wydeman, Publisher "Examiner," Kenora, Ontario, Canada; A. E. Lee, Vice-President, The Dawson Electric Light & Power Company, Ltd., Dawson, Yukon Territory, Canada; E. Marchand, Manager, Bank of Nova Scotia, Rockland, Ontario, Canada; Michel G. LaRochelle, Hunter Building, Ottawa, Ontario, Canada.

There are thousands of members of the World Metric Standardization Council in the United States of America. The Advisory Committee for the United States has already been named in this chapter. Among those who have enrolled their names at the central headquarters may be mentioned the following:

Manuel Gorbea, Chief, Bureau of Weights and Measures, San Juan, Porto Rico; R. H. Jackson, Rear Admiral, Navy War College, Newport, R. I.; Thomas Hall, Secretary of State, Bismarck, North Dakota; Nellie A. Hayward, State Chairman, National Woman's Party, Douglas, Arizona; Carl Hering, 210 S. 13th Street, Philadelphia, Pa.; Jeannot Hostmann, Chairman, Committee on Weights and Measures, American Pharmaceutical Society (3000 members); Arthur G. Hulett, Secretary, Arizona State Board of Pharmacy, Phoenix, Arizona; E. J. Abbott, Treasurer, Hillsborough Mills, Wilton, N. H.; Albert Theo. Amann, Secretary, Philadelphia Rifle Club,

Philadelphia, Pa.; Edgar Evans, Manager, The Republic Rubber Corporation, St. Louis, Mo.; William Sulzer, 115 Broadway, New York City; Sterling P. Fergusson, United States Weather Bureau, Washington, D. C.; G. S. Horne, for American Shipbuilding & Dock Corporation, Beaufort, S. C.; D. J. Tinnes, Hunter, North Dakota; R. B. von Kleinsmid, President, University of Arizona; Horace R. Hobart, formerly Editor, "The Railway Age," Chicago; James Wm. McGuire, representative of Coast and Geodetic Survey on U. S. Geographic Board, Washington, D. C.; W. A. Graham, Commissioner of Agriculture for North Carolina, Raleigh, N. C.; C. R. Lanman, Professor of Oriental Languages, Harvard University, Cambridge, Massachusetts; Oswald Schlokow, 1162 Pacific Street, Brooklyn, New York; Walter P. White, Geophysical Laboratory, Washington, D. C.; Victor Hugo Duras (formerly United States Vice-Consul at Petrograd, Russia), Union Trust Building, Washington, D. C.; Arthur R. Leonard, Chamber of Commerce, Columbus, Ohio; H. C. Lenfest, Naval Architect, St. Joseph, Missouri; Henry Torrance, ice machinery, 175 Christopher Street, New York City; E. Masson, Deerwood, Minnesota (who writes, "Most important movement in business world"); Miss Ellen M. Stone, famous Missionary, 311 C Street, N. W., Washington, D. C. (who writes, "Having lived and taught in Bulgaria more than 20 years, where the metric system was in force, I believe in its introduction into America"); Isidore Armijo, Taos, New Mexico; E. B. Babbitt, Brigadier-General, United States Army, Camp Dodge, Iowa; R. C. Breth, manager, Chamber of Commerce, Canton, Illinois; Paul M. Downing, Vice-President, Pacific Gas & Electric Company, San Francisco; M. R. Drury, 1722 4th Avenue, Cedar Rapids, Iowa; Louis V. Caziarc, Brigadier-General, United States Army, retired, 6 New Street, Charleston, S. C.; L. D. Clark, Bureau of Labor Statistics, Washington, D. C.; Alvin H. Low, 1417 S. Hoover Street, Los Angeles, California; Robert M. McWade, United States Conciliation Commissioner, Washington, D. C.; Mordecai Crawford, Brigadier-General, United States Army, Washington, D. C.; E. H. Delling, Chief Engineer, Stanley Motor Car Company, Newton, Massachusetts; 3 Dillon Brothers, farmers and stock-raisers, Marling, Missouri; T. Harrison Cummings, Librarian, Cambridge Public Library, Cambridge, Mass.; Alfred L. Lomax, Professor of World Trade, School of Commerce, University of Oregon, Eugene, Oregon; Fred A. Britten, Member of Congress from Illinois, Washington, D. C.; F. A. del Valle, Engineer, Porto Rico Telephone Company, San Juan, Porto Rico; Charles McCaffree, South Dakota Industrial Commissioner, Pierre, South Dakota; Thomas Corwin Mendenhall, Ravenna, Ohio; F. A. Postnikov, 1633 Dwight Way, Berkeley, California; W. W. Murray, Factory Manager, Continental Can Company, Inc., Canonsburg, Pa.; T. H. Nilson, American Steel Foundries, Sharon, Pa.; Edward S. Parsons, President, Marietta College, Marietta, Ohio; Mme. Marie Light-Plisé, member International Kindergarten Union, San Francisco; William Schaw, Schaw Batcher Company, Sacramento, California; Addison E. Sheldon, Nebraska State Historical Society (1400 members), Lincoln, Nebraska; E. D. Shepard, President, Genesee Wesleyan Seminary, Lima, New York; F. Enly Warner, Vice-President, The Ronald Press Co., Business Publications, 20 Vesey Street, New York City; E. J. Sherwood, Manager, Mitchell Power Company, Mitchell, South Dakota; Curt S. Siegelé, President and Treasurer, Color Service Corporation, New York City; C. G. Vincent & Co., Publishers, "La Gaceta de los Estados Unidos," Los Angeles, California; I. C. Thorssen, United States Surveyor-General for Utah, Salt Lake City, Utah;

Spencer Heath, manufacturer, 1221 Covington Street, Baltimore, Maryland; A. H. Smith, Manufacturers and Inventors Electric Company, New York City; Edgar B. Kay, Consulting Engineer, Washington, D. C.; J. T. Staub, Treasurer, United Railways & Electric Company, Baltimore, Maryland; George W. Briggs, Editor, "Commercial News," St. Louis, Missouri; N. I. Stone, Labor Manager, Hickey-Freeman Company, Rochester, N. Y.; Robert D. Wall, State Veterinarian, Des Moines, Iowa; E. Sundberg, President, Bank of Napoleonville, and Louisiana Cooperative Company, Napoleonville, Louisiana; Phil Weiss, Grand Secretary, American Registered Pharmacists; E. O. McCormick, Vice-President, Southern Pacific Company; Erving Winslow, Secretary, Anti-Imperialist League, 202 Prospect Street, New Haven, Connecticut; Walter Wood, 400 Chestnut Street, Philadelphia, Pa.; J. F. Pinkerton, Secretary, Farmers' Organization, Berdan, Illinois; C. Louis Diesterweg, General Manager, Econometer Company, St. Louis, Missouri (who writes, "We manufacture Fabric Measuring and price computing machine, equipped with metric system"); S. D. Scudder, Vice-President and Treasurer, 4th Ward Trust Company, Passaic, New Jersey (who wrote to W. H. Hammer, President of the Council, "Hammer until you get them! It is an absolutely necessary step towards universal peace"); W. Maxwell, President, The National Bank of Commerce in Pittsburg, Kansas; F. L. Atwood, Vice-President and Director of Manufacturing, Midwest Engine Company, Indianapolis, Indiana; H. W. Force, President, California Corrugated Culvert Company, West Berkeley, California; Fort Schuyler Knitting Mill, Utica, New York; Jamaica Dyewood & Chemical Company, 50 Church Street, New York City, by George M. Howell, President; Island Petroleum Company, Baltimore, Maryland; Hamilton Manufacturing Company, Columbus, Ohio; Frontier Manufacturing Company, North Tonawanda, New York; Freadrich Belting Company, Manufacturers, St. Louis, Missouri; Accounting Machine Company, New York City; Howe Rubber Company of California, Los Angeles, California; Imperial Machine Company, 1611 Central Avenue, Minneapolis, Minnesota; Holland Food Corporation, 100 Hudson Street, New York City; The Haslett Warehouse Company, 228 Pine Street, San Francisco, California; United Lithograph and Printing Company, Rochester, New York; Taber Electric Company, Red Wing, Minnesota; The Hamilton Company, 50 Church Street, New York City; Union Trust Company, and Union Title Company, San Diego, California; Tulsa Gasoline Manufacturing Company, Tulsa, Oklahoma; Yerkes Astronomical Observatory, thru Edwin B. Frost, Director, Williams Bay, Wisconsin; Superior Laboratories, thru T. H. Tapley, President, Grand Rapids, Michigan; California Grape Syrup Company, 149 California Street, San Francisco, California; Stroh Casting Company, thru B. Stroh, Jr., President and Treasurer, Detroit, Michigan; Associated Import and Export Company, Inc., 116 West 32nd Street, New York City; Sonoita Mercantile Company, Sonoita, Arizona; Artcraft Manufacturing Company, Washington, N. J.; Jacuzzi Bros., airplane manufacturers, Berkeley, California; Scientific Utilities Company, 84 East 10th Street, New York City; Pioneer Construction Company, Kansas City, Missouri; Overland Trading Company, 103 East 125th Street, New York City; Nelson Tool Company, 781 East 142nd Street, New York City; Naugatuck Malleable Iron Works, Naugatuck, Connecticut; The Crete Mills, flour mills and grain elevators, Crete, Nebraska; Maricopa Creamery Company, Phoenix, Arizona; Lyon Storage Company, Newark, New Jersey;

Dalton Adding Machine Company, Norwood, Ohio; Merchandising Publishing Corporation, by P. A. Mandabach, President, 608 South Dearborn Street, Chicago, Illinois; Columbia Fastener Company, 3229 South Ashland Avenue, Chicago, Illinois; Nashville Hardwood Flooring Company, Nashville, Tennessee; Sharples Separator Co., by P. M. Sharples, President, West Chester, Pennsylvania; Chattanooga Stamping & Enameling Company, Chattanooga, Tennessee; Arizona Commission of Agriculture & Horticulture, Phoenix, Arizona; American Separator Company, by Thomas Collins, President, Bainbridge, New York; A. B. Hoen, M. A., of A. Hoen & Company, Baltimore, Maryland (who writes, "The firm is the oldest lithographic house in America, founded 1835, and has for half a century been makers of fine maps and scientific illustrations"); Advance Manufacturing Company, Minneapolis, Minnesota; Eugene Suter & Company, 120 Broadway, New York City; The Erickson Construction Company, by C. Erickson, Treasurer, Seattle, Washington; Finnish Lutheran Book Concern, Hancock, Michigan; Ehrey Chemical Works, Humacas, Porto Rico; Clarence E. Edson and Associates, importers and exporters, Cleveland, Ohio; Eclipse Electric Manufacturing Company, St. Paul, Minnesota; American Chemical Company, Lebanon, Pa.; General Steamship Corporation, San Francisco, California; Fyrac Manufacturing Company, spark plug manufacturers, Rockford, Illinois; Chain-o'-Spark Corporation, Minneapolis, Minnesota; Advance Engineering Company, Indianapolis, Indiana; California Almond Company, Arbuckle, California; The Eastern Malleable Iron Company, Naugatuck, Connecticut; American Sponge and Chamois Company, Amsco Building, New York City; Globe Electric Company, Milwaukee, Wisconsin; The Breakers Hotel Company, Atlantic City, New Jersey; Flemington Naval Stores Company, Raleigh, Florida; United Light and Railways Company, by R. Schaddelee, Vice-President, Grand Rapids, Michigan; Atlas Powder Company, New York City; Commercial Club, Warner, South Dakota; Kalifornia Esperantista Rondaro, 946 Central Avenue, San Francisco, California; Logan County (Illinois) Medical Society, Lincoln, Illinois; Scandia Co-operative Association, Escanaba, Michigan, by F. O. Beck, Secretary; J. R. Lauritzen, President, American Lutheran Bible Society, Knoxville, Tennessee; Harold V. Whelan, Foreign Trade Secretary, South Bend (Indiana) Chamber of Commerce; Wichita County Dental Society, Wichita Falls, Texas, by R. E. Huff, Jr., Secretary-Treasurer; Women Lawyers Association, 165 Broadway, New York City; representative in Council, Miss Annette Adams, California; E. A. Warner, Manager, Chamber of Commerce, Kankakee, Illinois (600 members); Douglas H. Burwell, Assistant Secretary, Phillipsville Board of Trade (500 members), Phillipsville, New Jersey; Columbia Commercial Club (400 members), Columbia, Missouri, by Russell Monroe, Secretary; I. O. O. F. No. 67, Ft. Meade, Florida (65 members); Little Rock Cotton Exchange, Little Rock, Arkansas (135 members); Commercial Union of America, Inc., 25 Beaver Street, New York City; Farran Zerbe, President, Pacific Coast Numismatic Society; Fort Collins Commercial Club, Fort Collins, Colorado, by O. J. Watrous, Secretary; Ukiah Chamber of Commerce, Ukiah, California, represented in Council by L. H. Foster, Treasurer; Congressional Information Bureau, Washington, D. C.; Holland-American Chamber of Commerce, San Francisco, California (350 members); Chamber of Commerce, Laredo, Texas; College of Engineering (Faculty), St. Mary College, Dayton, Ohio; Divide Tonopah Chamber of Mines, by J. F. Crumley, Chair-

man, Tonopah, Nevada (100 members); Berkeley Chamber of Commerce, Berkeley, California, by Wells Drury, President (700 members); Viroqua Advancement Association, Viroqua, Wisconsin; American Textile Bonding Company, Philadelphia, Pa.; D. T. Berry, Traffic Efficiency Bureau, San Francisco, California; Bisbee Improvement Company, Bisbee, Arizona; Chicago Paper Company, Chicago, Illinois; A. J. Grace, Vice-President, Dakota Lumber Company, Roseglen, North Dakota; Haenichen Bros. Silk Company, 1 Broadway, Paterson, New Jersey; Yale State Bank, Yale, Michigan.

The World Metric Standardization Council invites the co-operation of all. Particularly, it is urged that the national legislators of the United States of America, and Britannia, be petitioned to enact metric standards legislation forthwith.

CHAPTER 8

METRIC LEGISLATION BEFORE CONGRESS

(United States of America)

TODAY the subject of metric standardization is prominently before both houses of the Congress of the United States of America. More than 103,000 petitions have been sent to the national legislative body, urging this advance to the world system of weights and measures. States with a total population of 14,000,000 have thru their legislatures memorialized Congress to take prompt action. As has been seen, thousands of powerful organizations are impressing upon Congress their firm conviction that it would be disastrous for the United States of America longer to lag behind. All elements in our population are urging the advance—and Congress is responsive. The enactment of metric legislation, putting the metric units into exclusive use in merchandising appears assured.

It will be of value to review briefly the history of metric legislation before Congress. For years the subject of world standardization has had the attention of thoughtful minds in our National Government, and many of our most eminent statesmen have urged it; yet at the crucial epochs they found themselves blocked by perverse forces of prejudice, habit and inertia—and, since 1871, hindered by insidious propaganda which has sought to keep the United States of America chained to a cumbersome, antiquated jumble of weights and measures.

George Washington Urged Standardization

The Constitution of the United States gives to Congress the authority to fix and establish weights and measures—one of the few rights thus granted of which Congress has not yet taken full cognizance. George Washington, in his message to the 1st United States Congress, 8 January, 1790, declared: "A uniformity of weights and measures is among the important objects submitted to you by the constitution **and if it can be derived from a standard at once invariable and universal, it must be no less honorable to the public council than conducive to the public convenience.**" Congress did not thus honor itself by adopting world metric standardization, but it at least

led the way in another advance whereby it proclaimed the superiority of the decimal system, on which the metric system is based.

At about the same time that James Watt was evolving the decimally-related system of weights and measures, a number of progressive Americans were working out a decimal money system—one of the first outside the Orient.

Jefferson and the Decimal System

In his "Life of Thomas Jefferson," James Schouler writes: "Jefferson's re-entrance into Congress (November, 1783) was fortunate in bringing about the establishment of our coinage system—the most perfect, it is no exaggeration to say, that the world ever experienced. The happy idea of applying the decimal notation of money, in place of the arbitrary pounds, shillings, and pence to which we had been habituated as British subjects and which we could not easily dismiss, originated 2 years earlier with Gouverneur Morris, who was assisting his celebrated namesake, Robert Morris, in the supervising of Continental finances. His able report to Congress, tho sound in the main, proposed in the penny a unit too minute and impracticable for ordinary use; but as a member of the committee to which the subject was referred in 1784, Jefferson rescued the leading idea from its false excrescence by proposing the dollar as the true unit, with its decimal divisions and subdivisions down to the copper 100th or cent, and with its further multiple of a 10-dollar gold piece. Jefferson and Morris discussed their several views in print, and after a postponement the committee agreed to report the plan of the former, and it was adopted the next year. To Morris, therefore, belongs the honor of proposing the decimal system; while Jefferson gains rightfully a new claim, which he never made, to popularity as father of the American dollar. **Jefferson stood all his life for a still broader reform against the stolid force of British habits; he wished the decimal system applied to all the weights and measures as well as to money.** Congress has express power, under our present Constitution, to regulate this subject as well as the other; and some day, when a new statesman leads American opinion who can educate, this change will come about, and the wonder will then be that it did not come earlier." [1]

Statesmen Favored Logical Units

If Thomas Jefferson had drawn up a Declaration of Independence against the tyranny of the obsolete jumble of weights and measures inherited from Britain, he would have had the signatures of George Wash-

[1] See *"Thomas Jefferson,"* by James Schouler; New York; Dodd, Mead and Company, 1919. Pp. 127-128. Also copious references in published correspondence of Jefferson; and citations in this volume.

ington, Benjamin Franklin, Alexander Hamilton, John Adams, Gouverneur Morris, James Madison and other founders of the Republic, for they all worked to that end. Repeatedly this matter was drawn to the attention of Congress, and it was only because of the mass of details attendant upon launching the new government that more progress in uniformity of weights and measures was not secured.

France, at the instance of Talleyrand, called a conference of European nations to discuss the establishment of a world system of weights and measures. Britain was invited to be represented, but the wrong-headed German king that sat on the British throne (the same that had estranged the American colonies) obstinately refused to participate: and the British people have suffered infinitely thru all the years because of this wilful isolation. The United States of America, then but a youth amongst the nations, was not invited to be a participant in the world conference out of which the metric system grew. Had it been, undoubtedly we should have secured metric standardization from the outset just as France did, with the further advantage that we already possessed decimal coinage. At any rate, the English-speaking peoples sat at a distance and watched the conference adapting the idea worked out by one of their own race, James Watt, and setting up therefrom the perfected metric decimal system, of which they refused to avail themselves. Well might it be asked, "What if we, not using them ourselves, had let Watt's other great inventions thus slip to other peoples?"

The year that France adopted the metric system, 1799, the United States of America was engaged in a "quasi-war" with France: and that no doubt exerted a deterring effect in keeping us from enjoying the benefits of metric standardization from the beginning.

James Madison Pleads for Metrics

Yet Americans were observant of the advantages of the world system of weights and measures, thus ingeniously worked out. Congress discussed the matter, and in his Annual Message of 1816, President James Madison wrote: "Congress will call to mind that no adequate provision has yet been made for the uniformity of weights and measures, also contemplated by the Constitution. The great utility of a standard fixed in nature, and founded on the easy rule of decimal proportions, is sufficiently obvious. It led the government at an early stage to preparatory steps for introducing it; and a completion of the work will be a just title to the public gratitude."

Unfortunately, the work was not completed. All the turmoil of the Napoleonic Wars had thrown the world into confusion, and France had not yet had sufficient opportunity to demonstrate the great practical utility of the metric system. John Quincy Adams, when Secretary of State, 1821, reviewed the subject in his "Report on Weights and Measures," and while he could not fully appreciate the rapidity with which the metric system would come into practical use thru its merits (at that time only one nation used it), he recognized the soundness of the plan and foresaw world metric standardization. "The meter will surround the globe," he prophesied, "in use as well as in multiplied extension; and one language of weights and measures will be spoken from the equator to the poles."

In 1847-48, the United States Secretary of the Treasury and the Superintendent of Weights and Measures urged world uniformity on the basis of the decimal system; and Salmon P. Chase, Secretary of the Treasury, in his annual report of 1861, pleaded that Congress should act promptly in adopting the international standards. The Civil War diverted the attention of American lawmakers from world affairs; yet they were advised officially of the rapid trend to metrics abroad. Probably at no era was there more discussion of metric standardization, and more general acceptance of the metric units as exclusive standards by the nations. The United States of America participated in the discussion, but unfortunately failed to act, due to internal conflict.

British Parliamentary Report Studied

In 1862 a British Parliamentary committee held extended hearings on the subject of metric standardization, and unanimously recommended that the British Isles should adopt the metric system. The monumental report of that committee, reprinted elsewhere in this volume, was laid before the Congress of the United States on 8 March, 1864. Abraham Lincoln was naturally interested in this world advance, as an essential measure in Reconstruction; and it was undoubtedly in accordance with his views that metric legislation was introduced into both houses of Congress.

It was in 1866 that the United States made the metric system legal, as an initial step to exclusive use of metric units at a near date. On 17 May, 1866, the Committee on Coinage, Weights and Measures of the House of Representatives urged that the use of the metric system be promoted thru this legislation, declaring that "the interests of trade will soon acquaint practical men with its convenience. When this is attained—a period, it is hoped, not distant—a further act of Congress can fix the date for its exclusive adoption as a legal system."

Charles Sumner as Metric Champion, 1866

That great American statesman, Charles Sumner, led the metric movement in the United States Senate. In a notable address on 27 July, 1866, he explicitly declared: "As the first practical step to this great end (world metric standardization) I ask the Senate to sanction the bills which have already passed the other House, and which I have reported from the special committee on the metric system." The metric bills were passed and became law. But the expected legislation to make the use of the metric units exclusive was not enacted. This, in the words of William G. McAdoo, was "a monumental mistake."

The British metric committee of 1862 examined more than 50 witnesses, yet declared, **"We have sought for advocates of the existing system, but have found it difficult to discover them."** In 1866 no objection was raised in either house of Congress to the passage of the metric legislation. It was tacitly admitted by all that exclusive metric standardization was inevitable in the near future, and that it would prove very beneficial.

Organized Propaganda Against Metrics

In 1871, however, the militant German Empire adopted the metric system. From that year on, there has been stirred up in the world (especially in the British Isles and the United States of America) a persistent propaganda against adoption of the world metric units by other nations. Where before there was little or no opposition to the advance, suddenly there appeared a clique of professional objectors who blocked every move by the English-speaking peoples to advance to the simple decimal system. Instead they were condemned by these obstructionists to continue bound by the cumbersome clutter of weights and measures which Germany scrapt in 1871.

It has been asserted by many competent investigators that insidious German propaganda has been constantly at work since 1871 to prevent metric legislation in the United States, and that this effort was particularly strong around 1917, when the United States entered the world war against Germany.

German Propaganda Charged

Paul Didier, member of the American Association for the Advancement of Science, declared in the Pittsburgh (Pennsylvania) "Despatch," 21 October, 1921: "Since 1871, Germany has been on equal footing with the metric system nations and we all know that they have thus beaten England and the United States in trade expansion. Since then, at various times, the metric system has come up for

adoption in England and the United States, but it was invariably drowned by German propaganda, as they did not want either England or the United States to take away their commercial oversea holdings. If Germany could do it in 18 months, why shouldn't we do it in 9 months? Now is the time to do it while we have nothing else to do but watchful waiting. In the meantime, put the United States scientifically on equal footing with its financial supremacy. Watch the Boche!"

Ben C. Dailey, President of the World Trade Club (Foreign Trade Club) of San Francisco, in testimony presented to Congress on 28 October, 1921, indicated the tremendous advantage gained by Germany thru keeping her opponents unstandardized: "Because of the standardized metric units, Germany from the outset in the war found it easy to work in concert with Austria, Hungary, Bulgaria and Turkey, which all had absolute military standardization on the metric basis. Here was a vast advantage for the Central Powers over their adversaries—an advantage on which they had fully reckoned in launching the World War. Some observers, indeed, believe that the Kaiser would never have dared to declare war if his potential opponents had possessed such standardization of munitions and supplies. When we realize the gigantic military efficiency gained by Germany thru using metric units while its enemies were handicapped with a diversity of units we may well direct our attention to the charge made by investigators of German world propaganda that the Kaiser long before 1914 had sent out the command to German secret agents everywhere, 'Hold Britain and America unstandardized at any cost until after Germany's next war.'" This same witness cited authority to show that the World War was unnecessarily lengthened at least 2 months thru lack of initial standardization of material by the allies, and that this meant the needless killing of 200,000 men and the needless maiming of 400,000 more.

German Anti-Metric Intrigue Revealed

The motive behind much opposition which has raged against metric standardization is revealed by Arthur E. Kennelly, world-known electrical expert and collaborator with Thomas A. Edison, writing in the Boston "Herald," 17 September, 1919: "It has often been stated in Germany that nothing would suit the German industries better than for the English-speaking peoples to remain fettered by their present complicated system of pound-foot-bushel measures, because this complex system is a handicap to the foreign trade of the English-speaking peoples, who are the principal competitors of the Germans."

The military reasons for the German effort to keep the English-speaking peoples unstandardized[1] have already been disclosed. About the time that discovery was made of the ownership of newspapers in the United States by German propaganda agencies, the powerful Pittsburgh "Post" pointed out the danger to America thru intrusion of foreign interests seeking to keep us off the metric basis. On 19 November, 1919, this journal said editorially: "The charge that German propagandists are combatting the movement for the introduction of the metric system of weights and measures in the United States has served to call attention to an advantage of the plan to which not enough consideration has heretofore been given. In inquiring into the reasons for the Teuton agents' opposition to the proposal it is alleged to have been discovered that they feared the adoption of the metric system in this country would handicap them in their efforts to win back the foreign trade which they lost to America during the war.

"Other things being equal, merchants of countries which have the kilogram and the liter as units, respectively, of weight and measure, are not going to buy goods put up in units of the pound or the quart if they can get it packed according to the method to which they are accustomed. And as Germany, in common with all other advanced nations except the United States and Great Britain, has the metric system, the Teutons think they have an advantage over this country in the competition for foreign trade. It is to their interest, therefore, to keep the system out of the United States. To this end, it is charged, they are conducting a cunning propaganda to arouse popular prejudice in favor of the retention of the antiquated and cumbersome system which we now have.

"We took a large part of this business away from Germany and Germany is going to try hard to regain it. If it is to her interest to prevent the United States from adopting the metric system it behooves us to give careful thought to the advantages of the plan."

Senator Frelinghuysen Makes Disclosures

Joseph S. Frelinghuysen of New Jersey (who presented the metric standards bill of 1920) on 8 December, 1921, placed astounding facts as to German propaganda activities before the Senate of the United States. He declared that German interests had for years maintained a lobby in Washington to prevent enactment of certain legis-

[1] Propaganda is not only directed against World Standardization for the United States, but even against our participation in World Trade at all. At the 1st annual convention of the Bankers' Association for Foreign Trade, held in Cleveland, 11 February, 1922, Dr. Julius Klein, Director of the United States Federal Bureau of Foreign and Domestic Commerce, vigorously attacked the authors of what he termed "insidious propaganda which like sand, deliberately put into bearings, is designed to slow down our export machine at the time of its greatest need." He explained that certain interests are endeavoring to minimize the necessity for greater exports, or in fact, any foreign trade at all. "This would be great for some of our crafty competitors," declared Dr. Klein.

lation there, particularly with reference to dyes and chemicals, and that the lobby is there today and intensely active. He declared that Germany was thus not only crippling the United States industrially but also rendering us utterly unprepared in the field of chemical warfare, and that as a result of this unpreparedness thousands of American lives were lost in the World War. Senator Frelinghuysen testified that thruout the Germans had as their allies, or dupes, a certain clique of "textiles manufacturers" who blocked legislation for the upbuilding of an American chemical industry because of their own selfish interests.

"The agents of the German interests are now here again in this Capitol," declared Senator Frelinghuysen. "Their agents are in this country. The German methods prior to the World War, from the standpoint of the dye industry and **of war munitions**, made this country prostrate. The history of our unpreparedness is known to everyone; but as a member of the Military Affairs Committee I made a study of certain phases of American 'statesmanship,' so called, and it is a continuous record of neglect, of lack of vision, of indifference toward national safety. . . For 40 years, the textile industries in this country had opposed a protective tariff on dyes and chemicals; the head of one great textile industry in New Hampshire organized the opposition and appeared before the Congress tariff committees. . . The book, 'The Riddle of the Rhine,' by Victor Lefelure, 'reveals the direct and indirect methods used by Germany to prevent, **at all costs**, the development of an independent organic chemical industry in the United States of America; and there are many pointed examples of the direct method.' The point I make is that Germany was organized and is organized now."

Referring to a letter sent on 25 May, 1921, from the German Embassy at Rome, Italy, to the German Minister of Foreign Affairs (and in which the phrase occurs, "It is necessary to strengthen this discontent in order to consolidate our situation thru economic action"), Senator Frelinghuysen emphasized the fact that German world propaganda is most active. "I have never read any letter," he declared, "referring to trade conditions which showed more careful design in an effort to capture commercial advantage than this letter. It shows the attitude of German business efficiency. It indicates that in every country on the face of the globe there are German agents and a German system fighting to get back this trade." (See "Congressional Record," 8 December, 1921.)

In view of this authoritative testimony, who can doubt that the German war chest was drawn upon to keep the United States eternally unprepared for the World War which Germany long had

planned? Who can doubt that the German attack on the chemical industry was made more bitter because of that industry's advocacy of metric units? Especially is this collusion with the Germans confirmed by the fact that a certain clique of textiles manufacturers worked as the dupes and allies of the propagandists, and that the spokesmen of this clique even during the war attacked the policies of the American Red Cross, seeking to prevent hand-knitting by American women for American warriors, and thus materially aided the enemy in seeking to break down American morale. These same agents, who "played into the hands of Germany," are today fighting metric standardization before Congress.

Enough has been disclosed to indicate one very great reason why metric legislation was "quashed" in the United States whenever it came up, during all that period in which virtually all the rest of the world was advancing to the standardized metric system. Metric legislation was indeed introduced, and was endorsed by all the special investigating committees in Congress; but the question was invariably "railroaded" and "sidetracked" so that a general vote of Congress on metric standardization was never attained.

Congressional Committees Unanimously Urge Metrics

In Chapter 14 of this book, "Look It Up," the reports of the metric committees are indicated. It will be seen that in 1879, 1896, 1897, 1898, 1901 and 1902 the Committee on Coinage, Weights and Measures of the House of Representatives urged metric standardization of weights and measures. These findings in favor of metrics were the result of comprehensive hearings in which all sides of the question were discussed.

The 1896 report declared: "Your committee, after a careful consideration of this subject, have unanimously reached the conclusion that the metric system of weights and measures should be put into exclusive use in the various departments of the Government[1] at such future date as shall allow adequate preparation for the change, and at the end of a fixed time thereafter that said system shall be recognized as the only legal system for general use." The 1897 report recommended "that the adoption of the metric system for use in the nation at large be fixed as coincident with the dawn of the 20th century." In 1901: "Your committee recommend that the bill do pass." In 1902: "Your committee earnestly recommend the passage of the bill."

Tho obstructionist tactics delayed the passage of these metric bills, the subject of metric standardization was repeatedly called to

[1] Samuel Vauclain, President of the Baldwin Locomotive Works, urged this procedure in his testimony before the U. S. Senate Committee on the Metric System, 1921-22.

the attention of Congress. Particularly was this the case because of the growth of Pan-American friendship; and numerous gatherings where all the Americas were represented petitioned the Congress of the United States to make the metric advance. James G. Blaine, as Secretary of State; Lyman T. Gage, as Secretary of the Treasury; James A. Gary, as Postmaster General; James Wilson, as Secretary of Agriculture; William C. Redfield, as Secretary of Commerce; Franklin K. Lane, as Secretary of the Interior; and many other eminent Cabinet officers worked in behalf of metric standardization and advised Congress of this advocacy. Reports of agents of the Department of Commerce thruout the world, urging metric standardization for the United States, were repeatedly called to the attention of our national legislators. Congress indeed passed many laws approving the use of the metric units in special fields (such as in coinage, postal laws, electricity, pharmacy, and so on), and confirmed the establishment of metric weights and measures in Cuba, Porto Rico and the Philippines. In 1901, the Bureau of Standards was established, looking to more complete standardization of weights and measures.

The Congress of the United States of America has also cooperated in the work of the World Bureau of Weights and Measures, an institution maintained under a convention of the nations. The United States of America and the British governments contribute financially to the upkeep of this World Metric Bureau, which was established in Paris, France, under pact proclaimed 27 September, 1878[1].

In 1905-6, the "New York Herald" conducted a metric questionnaire, in which the opinions of thousands of organizations, concerns and individuals were cited in favor of gradual metric standardization; and these were placed before Congress in the form of petitions.

Metric Petitions Flood Congress

In the years immediately preceding the World War the Congress of the United States was virtually idle on the important matter of world standardization. The main reasons for this have been revealed. Elsewhere in this volume it has been indicated, also, how in 1917-18 the United States was led to utilize the metric units in military affairs, and how this aided powerfully in gaining the ultimate vic-

[1] Provisions of the world agreement: Art. 1. World Bureau of Weights and Measures established. 2. Special building. 3. World Committee. 4. General conferences. 5. Regulations. 6. Duties of the Bureau. 7. Bureau officials. 8. Prototypes of meter and 1000 gram. 9. Expenses not to exceed 100,000 francs yearly. 10. Contributions. 11. Contributions from acceding countries. 12. Future modifications. 13. Duration. 14. Ratification, voted unanimously. It was a true world conference, and among the countries that signed were: U. S. America, Germany, Austria-Hungary, Russia, Turkey, Argentine, Belgium, Brazil, Denmark, France, Spain, Peru, Sweden, Switzerland, Venezuela, Italy, Guatemala, Netherlands, Salvador. It was of this world meeting that Josh Billings remarked: "Never did so many Kaizers, Kzars, Kings, kum kling knit together in so Klean a Kawse to work so Kommendable a kure."

tory. The people came to a recognition of the vital need for the metric advance, and petitions by the thousands poured in urging Congress to take action. A multitude of these petitions were addressed to individual legislators, and thus could not be counted; but many were addressed to Congress as a unit, and to the President of the United States. These have been placed in the custody of the United States Department of Commerce, Washington, D. C. On 29 October, 1921, all the petitions were counted and found to number 102,842.

The petitions are itemized as follows:

CLASSIFICATION OF PETITIONS ON FILE WITH THE U. S. DEPARTMENT OF COMMERCE REGARDING THE EXCLUSIVE USE OF THE METRIC SYSTEM OF WEIGHTS AND MEASURES

	For	Against
Manufacturers and Engineers	15,501	401
Trade	14,589	125
Education	37,244	138
Medical and Surgical	11,069	224
Federal and State Officials	1,080	8
Agriculture	1,811	17
Accountants	399	2
Attorneys	3,221	52
Vocation not stated	12,674	177
Miscellaneous	4,094	16
Total	101,682	1,160

It will be observed that practically 99% urge metric standardization, and that little more than 1% oppose. Individuals, concerns and organizations were of course at liberty to send in petitions to legislators either for or against the general use of meter-liter-gram. Tho opponents persistently urged that petitions be sent to Washington, D. C., *against* the metric advance, the negligible results go to prove the fact that objection to metric standardization comes from only a microscopic minority. When we see the practical unanimity of people and organizations representing every known human vocation; when we perceive that they are virtually all in favor of metric standardization of weights and measures, then again comes the question, "Can an insignificant minority, by misrepresentation and clamor, obstruct an advance so necessary to the welfare of humankind?"

Pro-Metric Petitions More Than 105,000

The results of the nationwide canvass of public opinion on the metric question were referred to the United States Department of Commerce at Washington, D. C. Without cost to the United States Department of Commerce, these petitions were classified and carefully counted under the direct supervision of W. Mortimer Crocker. Thousands were found to have registered their votes by postal card, but other thousands had written strong letters to Congress urging prompt adoption of the world units.

Since the above tabulation, many more petitions have been sent forward. Furthermore, the several thousand statements contained within the present volume in favor of metrics have been transmitted to the Department of Commerce, to be called officially to the attention of Congress. Altogether, the pro-metric petitions number more than 105,000.

It has been pointed out already that many of these petitions are from organizations and concerns having hundreds and thousands of members, and that therefore these petitions represent directly several million voters.

States Memorialize Congress for Metrics

In 1921, the State legislatures of California, Illinois, Tennessee and North Dakota memorialized Congress to enact the metric standards bill. These petitions were incorporated into the Congressional Record. The following resolution of the State Senate of Illinois is typical:

SENATE RESOLUTION No. 55

State of Illinois

Introduced by Mr. Swift, 3 May, 1921.

WHEREAS, there is in the United States a deplorable lack of uniformity in weights and measures, and the units used are unscientific, cumbersome, and unrelated, constituting an actual hindrance to education, industry, world trade and the activities of daily life; and

WHEREAS, the metric system of weights and measures is a decimal system, simple, logical, and easy to use, so that its adoption will result in an incalculable saving in time and energy; and

WHEREAS, the metric system has been adopted by the vast majority of enlightened nations, and its adoption by the United States is calculated to promote friendly relations and commerce with all the world; and

WHEREAS, the State of Illinois, by reason of its great commercial and industrial activities, is vitally interested, both as a State and in behalf of its citizens, in the speedy adoption of world-wide uniform standards of weights and measures; now, therefore, be it

RESOLVED, That the State Senate of the State of Illinois respectfully urges that the units of the metric system be adopted by the Congress of the United States as the legal standard of weights and measures after a transition period of 10 years, as proposed in bills now before Congress; and be it further

RESOLVED, That copies hereof be forwarded to the President of the United States of America and to the Senators and Representatives of the State of Illinois in the Congress of the United States.

Adopted by the Senate, 12 May, 1921.

(Presented in the United States House of Representatives by Congressman Fuller and Congressman Sabath, of Illinois.)

The Frelinghuysen Metric Bill

The attention of the Congress of the United States was directed toward metric standardization thruout 1919 and 1920, scores of national legislators pledging their aid in enacting metric legislation when it came before Congress. Among the 103,000 petitions urging metric standardization on file with the Department of Commerce, Washington, D. C., there were several thousand from the State of New Jersey; and it was in response to such requests as these that Hon. Joseph S. Frelinghuysen, Senator from New Jersey, introduced a Metric Standards Bill (S. 4675) in the Senate of the United States, 16 December, 1920. This bill "to fix the metric system of weights and measures as the single standard for weights and measures" was most liberal in its provisions, allowing 10 years for the transition period. Under this act, manufacturers were to continue to use whatever measures they desired in production, but after 10 years all commercial transactions were to be upon the world metric basis.

It was particularly appropriate that Joseph S. Frelinghuysen should introduce the Metric Standards Bill, since his distinguished family had for more than a century aided the promotion of the decimal system in the United States. He is the 4th of his family to occupy a seat in the United States Senate. In 1793-96, the period in which decimal coinage was adopted for the United States of America, Gen. Frederick Frelinghuysen sat in Congress as Senator

© J. S. FRELINGHUYSEN

© DUNCAN U. FLETCHER

© ARTHUR CAPPER

© WILLIAM B. McKINLEY

© A. A. JONES

© ROBERT L. OWEN

© G. W. NORRIS

© WILLIAM S. KENYON

© JULIUS KAHN

© A. J. SABATH

© CAPT. ALBERT JOHNSON

© S. S. ARENTZ

NATIONAL LEGISLATORS AMONG THOSE FAVORING METRIC STANDARDIZATION

(Fletcher photo © by "International"; Kahn photo © by Hartsook; all others © by Harris & Ewing, Washington, D. C. For photos of Britten and Ladd see pages 448-449.)

GEORGE WASHINGTON

THOMAS JEFFERSON

JAMES MADISON

BENJAMIN FRANKLIN

ALEXANDER HAMILTON

JOHN QUINCY ADAMS

GOUVERNEUR MORRIS

ROBERT MORRIS

SIR JOHN LUBBOCK

JAMES WATT

CHARLES SUMNER

© ANDREW CARNEGIE

PRE-EMINENT MEN WHO WORKED FOR WORLD UNIFORMITY OF COINAGE, WEIGHTS AND MEASURES

(Carnegie photo © by Underwood & Underwood, N. Y.)

from New Jersey. Another eminent man, Frederick Theodore Frelinghuysen was a member of the United States Senate in 1866, the year in which Congress under the leadership of Charles Sumner adopted the metric units as legal standards for the United States of America. This Frelinghuysen was a close associate of Charles Sumner, the metric champion.

Joseph S. Frelinghuysen, one of the present leaders in the Senate of the United States, is known as a personal friend and advisor of President Warren G. Harding. He has a record of success in business, and is one of the best-known Insurance men in the country. He is a veteran of the Spanish-American War; for several years was President of the State Board of Education of New Jersey; is now, and long has been, President of the Department of Agriculture of New Jersey; and has had many other honors conferred upon him. He was elected to the Senate in 1917.

Widespread interest was attracted to the Frelinghuysen Bill, and nationwide endorsement was given.

The Britten Metric Bill

In the House of Representatives a very able champion has striven in behalf of metric standardization. This is Hon. Fred A. Britten, representing the 9th District of Illinois—part of the City of Chicago. In working for the metric system, Congressman Britten is following the undeniable mandate of his constituents, for the State Senate of Illinois has memorialized Congress to enact a metric standards bill, and the Board of Aldermen of the City of Chicago has gone on record in favor of the metric system by unanimous vote (66 to 0). Hundreds of industrial and business concerns in Illinois are urging metric standards likewise. Mr. Britten is responsive to this demand. On 29 December, 1920, he introduced a metric bill in the House of Representatives practically identical to that already presented to the Senate. At the beginning of the new session of Congress, not long after, (11 April, 1921) he again introduced a similar Metric Standards Bill, known by the appropriate title "H. R. 10," emphasizing the need for the decimal metric system.

Fred A. Britten is a practical business man, having been since 1894 engaged in the general building construction business, doing work in different parts of the United States. He is a Republican, and is recognized as among the most influential members of the House of Representatives, where he has been since 1913. It is interesting to note that while he has long been a resident of Chicago, he also lived for some time in San Francisco, a community which in many ways has taken a prominent part in the movement for world metric standardization.

The Ladd Metric Bill

In the United States Senate during 1921-1922 the cause of metric standardization has been furthered by many able men, headed by Hon. Edwin F. Ladd, Senator from North Dakota. On 18 July, 1921, Senator Ladd introduced a metric standards bill in the Senate identical with that presented in the House of Representatives by Congressman Britten. In this, Senator Ladd likewise carried out the expressed wishes of his constituents, the State Senate of North Dakota having petitioned the United States Congress to take prompt action in enacting metric standards legislation.

Edwin F. Ladd was born in the State of Maine. His educational training was as a chemist; he thus has practical experience in using the metric system since 1884. He was Dean, School of Chemistry and Pharmacy, North Dakota Agricultural College, and chief chemist, North Dakota Agricultural Experiment Station, from 1890 to 1916. From 1916 to 1919 he was President of the North Dakota Agricultural College. Senator Ladd has a long and honorable record in the promotion of Agriculture, and he is one of its foremost spokesmen in national affairs. For 5 years he was Editor and Publisher of the "North Dakota Farmer"; he was a member of the national Farmers' Marketing Committee of 17; a member of the Standards Committee on Food Products for the United States of America; Food Commissioner of North Dakota for many years, holding this important post during the World War; and was also a member of the Federal Committee on the Price of Wheat. He has been President of the National Association of Official Agricultural Chemists, and President of the National Association of Dairy, Drug and Food Officials—both of which organizations have worked actively for world metric standardization. He is a member of the Society for Promotion of Agricultural Science; American Public Health Association; American Chemical Society, and many others. He was elected United States Senator from North Dakota in 1920 by an overwhelming majority.

Text of the Britten-Ladd Bill

It will be well to give here the text of the Britten-Ladd Metric Bill, which is brief and to the point. While its provisions may be modified somewhat as the result of new light thrown on metric standardization by Congressional Hearings, it forms the substantial basis on which metric legislation in the United States of America is sure to be founded. Here is the text:

S. 2267—H. R. 10

A BILL

To fix the metric system of weights and measures as the single standard of weights and measures for certain uses.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That from and after ten years from the date of passage and approval of this Act the weights and measures of the meter-liter-gram or metric system shall be the single standard of weights and measures in the United States of America for the uses set out herein.

SEC. 2. That the national prototypes of the fundamental standards of the metric system shall be the copies of the standards known as meter numbered twenty-seven and kilogram numbered twenty, allotted to the United States by the General Conference of Weights and Measures held at Paris in 1889. These are now deposited in the vault of the Bureau of Standards of the Department of Commerce and are those which are now used and employed in deriving the values of all weights and measures used in the United States. These national representations are hereby adopted as the primary standards of weights and measures for the United States of America, and from these all other weights and measures shall be derived and ascertained.

SEC. 3. That from and after ten years from the date of passage and approval of this Act no person shall do or offer or attempt to do any of the following acts, by weights or measures, in or according to any other system than the metric system of weights and measures, namely:

(1) Sell any goods, wares, or merchandise except for export, as provided in section 8;

(2) Charge or collect for the carriage or transportation of any goods, wares, or merchandise.

SEC. 4. That from and after ten years from the date of passage of this Act no person shall use or attempt to use in any of the transactions detailed in section 3 any weight or measure or weighing or measuring device designed, constructed, marked, or graduated in any other system than the metric system of weights and measures.

SEC. 5. That not later than ten years from the date of passage and approval of this Act all postage, excises, duties, and customs charged or collected by weights or measures by the Government of the United States shall be charged or collected in or according to the metric system of weights and measures.

SEC. 6. That rules and regulations for the enforcement of this Act not inconsistent with the provisions hereof shall be made and promulgated by the Secretary of Commerce. The Secretary of Commerce shall also take such steps as he may deem expedient for giving publicity to the dates of transition specified herein and for facilitating the transition to the meter-liter-gram or metric system.

SEC. 7. That all Acts or parts of Acts inconsistent herewith are hereby repealed but only in so far as they are inconsistent herewith; otherwise they shall remain and continue in full force and effect. Whenever in any Act, or rules and regulations, or tariff or schedule made, ratified, approved, or revised by the Government of the United States of America weights or measures of the system now in customary use are employed or referred to,

and to comply with the provisions of this Act weights and measures of the metric system should be employed, then such references in such Act, rules and regulations, tariff, or schedule, shall be understood and construed as references to equivalent weights or measures of the metric system ascertained in accordance with the required degree of accuracy.

SEC. 8. That nothing in this Act shall be understood or construed as applying to—

(1) Any contract made before the date at which the provisions of this Act take effect;

(2) The construction or use in the arts, manufacture, or industry of any specification or drawing, tool, machine, or other appliance or implement designed, constructed, or graduated in any desired system;

(3) Goods, wares, or merchandise intended for sale in any foreign country, but if such goods, wares or merchandise are eventually sold for domestic use or consumption then this clause shall not exempt them from the application of any of the provisions of this Act.

SEC. 9. That nothing herein shall be understood or construed as prohibiting the enactment or enforcement of weights and measures laws or ordinances by the various States or cities, and the various States or cities shall have the same powers as though this Act were not in force and effect: *Provided, however,* That no standard weights or measures shall be established for the uses set out herein which conflict in any way with the standards established herein, and such standards which may already have been established shall be null and void for the uses set out herein.

SEC. 10. That the word "person" as used in this Act shall be construed to import both the plural and singular, as the case demands, and shall include corporations, companies, societies, and associations. When construing and enforcing the provisions of this Act, the act, omission, or failure of any officer, agent, or other person acting for or employed by any corporation, company, society, or association, within the scope of his employment or office, shall in every case be also deemed to be the act, omission, or failure of such corporation, company, society, or association as well as that of the person.

Strong Metric Advocacy in Congress

Scores of influential members of the Congress of the United States of America are urging gradual metric standardization, and have signified their intention to vote for the Britten-Ladd Bill. Typical of their attitude is the statement made by Hon. **Julius Kahn,** Representative from California: "I believe this country can well afford to adopt the metric system. I have been in favor of legislation to that effect for the last 20 years." Hon. **Arthur Capper,** United States Senator from Kansas, has declared: "I shall be glad to support the metric movement in any way I can." The leadership of Senator Capper and Senator Ladd is followed by a strong group of 21 members of the United States Senate, representing mainly the agricultural States of the South and West, who have agreed on a program of legislative activity, and press reports in 1921 stated that

one of the legislative measures which they are pledged to support is the Metric Standards Bill.

The entire country now recognizes this world standardization movement as one of vital importance. Indicating the trend of opinion is an article in "Automotive Industries," 22 December, 1921, headed "Metric System Bill a Live Issue," and forecasting upon advices from Washington that the Bill will be reported out of conference and discussed on the floor of Congress in the spring of 1922. Scores of other publications have emphasized the vital interest in this legislative measure.

U. S. Senate Metric Hearings

Hearings on the Ladd Metric Standards Bill (S. 2267) have been held in 1921-1922 before a sub-committee of the Committee on Manufactures, United States Senate. The sub-committee consists of Charles L. McNary, Oregon, Chairman; Ovington E. Weller, Maryland; and Andrieus A. Jones, New Mexico. A majority of this committee has already declared its belief in the principle of metric standardization.

The Hearings began in the rooms of the Committee on Manufactures, United States Capitol, Washington, D. C., on 11 October, 1921. In the course of the Hearings, more than 50 metric advocates have presented their testimony to the committee. They represent every branch of human endeavor—manufacture, agriculture, world trade, science, education, invention. In concluding this review of Metric Legislation Before Congress, brief excerpts from their testimony will be presented. This evidence will be found printed in full in United States Government official documents:

Elwood Haynes, President, Haynes Automobile Company, Kokomo, Indiana: "I very decidedly favor the adoption of the metric system. I think the 10-years transition period is plenty of time. As to the time that would be saved to the students in the schools (thru adoption of the metric system), I should say roughly a year to a year and a half. I believe I could teach the metric system in 10 days so that the students would take it up and be able to work it. It would take a year or 2 to get the other (the present jumble)."

Samuel M. Vauclain, President, Baldwin Locomotive Works, Philadelphia, Pa.: "The metric system is a thing to which I have given a great deal of consideration. I believe that if the country were legally on the metric system, instead of the English system, that it would be very much more convenient, very much more desirable. It provides great simplicity of measurement of all kinds. There is nothing to be thrown away, that I can see, to make the change. It would be a trifling affair. I cannot see, really, any reason why we should not have the metric system. There would be no difficulty in everybody adopting it, and I think without expense—probably with profit." (In the course of his testimony, Mr. Vauclain said: "The Bureau of Weights and Measures have given this matter a great deal

of consideration and research, and I think the Committee should attach great weight to what they might have to say." The Chairman replied: "We have had them here. They are for it.") [See testimony elsewhere in this volume on manufacture of locomotives to metric specifications by Baldwin Locomotive Works.]

Theodore H. Miller, Works Manager, DeLaval Separator Company, Poughkeepsie, New York: "I want to stress the point about the little or no cost to change over a manufacturing establishment from the English to the metric system. With us this is not theorizing; we have done it. The cost of changing over our manufacture to the metric basis was practically nothing; it could not be found. We simply express sizes in the metric system because it is more simple and less liable to error than the English. In the machinery manufacturing business, there are no difficulties and practically no expense to the change; but, on the other hand, there are many advantages. It is our experience and belief that the slight cost there is will be more than paid in the very first year of operation. In our factory, where we have as high as 1700 people, there are no difficulties. Anyone who has the intelligence to work in a plant, and hold a job there, can learn all that he needs to know about the metric system, as applied to the work he is doing, in 30 minutes. And there is no necessity of throwing away anything."

William Jay Schieffelin, President, Schieffelin & Co., wholesale druggists and manufacturers, New York City: "The complication and the delay, not only in business, but in ordinary life, that this present lack of system entails upon us is a greater handicap than any of us appreciate. Nothing could be more stupid. The Metric Standards Bill provides that the government shall educate the people during the 10 years (transition period), and they will gradually get used to the metric system. I think it would be a valuable amendment to the bill to say that in 5 years all the dealings of the government should be in the metric system. It does more than half of it now in the metric system."

Arthur Bessey Smith, Chief Research Engineer, Automatic Electric Company, Chicago, Illinois: "Our company is preparing to operate upon the metric system exclusively. The advantages which we have found from the use of the metric system for our measurements and calculations are great. Under the metric system, there is no change whatever in the dimensions of any parts of our apparatus, either of the machines which we use or of the finished product. The actual money outlay will be practically insignificant compared with the total volume of business which we do, which will run between $4,000,000 and $5,000,000 a year. We feel that we can not longer deprive ourselves of the advantages of the simplicity and economy of using this system. That is a settled point with us. It will be of assistance to us and to every other manufacturer that wants to progress, if the rest of the country comes with us. I think the change to the metric system is very greatly needed by the United States of America." (Mr. Smith gave tabulated figures of the slight cost of change-over to the metric basis in the great factory of the Automatic Electric Company; and these will be found printed in the Metric Hearings, Part 1.)

Eugene C. Bingham, Professor of Chemistry, Lafayette College, Easton, Pa.; Chairman, Metric System Committee, American Chemical Society: "Already 190 of the colleges and universities of the United States have agreed to ask for specifications and purchase as far as practicable all of their chemicals and chemical apparatus on the basis of the metric system.

The Eastman Kodak Co. is already manufacturing synthetic chemicals and dispensing them entirely on the metric basis."

David A. Molitor, Civil and Consulting Engineer, Detroit, Michigan; at one time designing engineer of the Panama Canal: "The metric system must be regarded as the dominant factor in securing foreign trade if the United States hopes to attain the position to which she is rightfully entitled. The United States of America must sell her goods in foreign markets in metric measures and not according to our antiquated standards. Of all comparatively recent cases, where manufacturing concerns have boldly plunged into metric units to save themselves from partial or entire elimination from export trade to metric countries, few, if any, have regretted the step. Most objections raised against the introduction of this eminently practical metric system are trivial. It is, therefore, unfortunate that such objections should dim the vision of our people. It is unfortunate, too, that the cost of changing over can be so easily overstated, and by our opponents be so glibly utilized to keep inert a goodly number of leading business men who can scarcely afford to ignore the splendid advantages offered them. The change involved in adopting the metric system in our own factory (Carl E. Schmidt & Co., tanners, Detroit, Michigan), where we employ about 200 men, was something like $75. If that expenditure could not be returned as a profit, then it was money wasted; but the concern considers it money well spent for the results accomplished." (Mr. Molitor's valuable testimony before Congress has been published separately in pamphlet form.)

S. L. Hilton, Washington, D. C.; President, American Pharmaceutical Association: "I want to say that the American Pharmaceutical Association has repeatedly gone on record favoring the adoption of the metric system. The bigger manufacturers in this country in pharmaceutical lines use the metric system in their manufacture. . . . China uses the metric system. A number of Chinese attended the Chicago meeting of the American Metric Association, 29-30 December, 1920, and the following interesting points were brought out: (1) That both China and Japan long ago officially adopted the metric system. (2) That metric weights and measures are extensively and increasingly used, and are replacing the various old weights and measures of the Orient. Even these old weights and measures were conveniently based on metric standards, and the old names were often used to express certain metric quantities. For instance, one Chinese *ch'ih* equals 32 centimeters, and one *y'ing* consisting of 100 *ch'ih*, equals 32 meters. Likewise, the Japanese *kin* is merely another expression for 600 grams. (3) By far the largest engineering works in China, the Han Yang Iron & Steel Works, has from the beginning used nothing but metric weights and measures. (4) It was the opinion of the Chinese present that while Americans did succeed in getting some business in China without the use of the metric system, they would be more helpful and successful if they dealt in terms of the metric system."

S. J. Macfarren, Washington, D. C.; traction engineer; industrial engineer of long practical experience: "It is axiomatic that uniformity in standards promotes intercourse and promotes the establishment of manufactures and industry. That applies just as much to the standards of weights and measures as to any other standards. For instance, the farmer is cheated every day when he sells his grain, he is cheated every day when he buys goods in the store, by the lack of the metric system. The tax which the lack of the metric system is imposing on the public today if expressed in

figures would surprise the country. . . . My residence in Mexico showed me that the metric system not only promotes domestic commerce but it promotes export trade, because it simplifies the transaction between buyer and seller. It is only a year or 2 since an invoice of goods was confiscated at a port in Peru (and it took the good offices of the State Department to release it) because the invoice was not in metric terms. That was the action of our South American friends, who are the best customers we can hope to have. . . . I would like to say that I have observed that the people who oppose the metric system are like the old man in the story who said he had had a heap of trouble, the most of which never happened."

John S. Hord, former Collector of Internal Revenue, Philippine Islands: "My experience with the metric system was in the Philippines during the years 1906 to 1910. There was a law enacted by the Philippine Commission in August, 1906, making the use of the metric weights and measures obligatory in the Islands. At that time I was collector of internal revenue for the Philippine Islands, and the enforcement of the law was placed in the internal revenue bureau. At that time there were about 8,000,000 people in the Philippines, some of them quite ignorant; but within a couple of years after beginning the installation of the metric system it was in general use. There was very little attempt to defraud the law. The people looked on it as a time-saver instead of a hardship. I can remember now practically no opposition to this law. We found that the metric system out there was far superior to the English or any other system in use there, as our dollars and cents are superior to the pounds, shillings and pence, for instance."

Harvey W. Wiley, Washington, D. C.; world authority on agricultural chemistry; for 30 years Chief of the Bureau of Chemistry, United States Department of Agriculture; now a farmer and editor: "I consider the farmer, of all business men, would be best served by the Ladd Metric Standards Bill (S. 2267). There is no other business where the confusion in the terms is so great as in what the farmer produces and in what the farmer buys. The idea of what a barrel is, or a bushel or a box, is so vague, so uncertain and so fugitive that a farmer in one State can not have any idea of anything more than in his own State, what it is. The moment he goes into another State he finds a different value placed upon it. So there is the utmost confusion. There is not a farmer in my part of the State who buys a ton of coal that knows how much he gets. In some States a ton of coal is fixed at 2,000 pounds and in others at 2,240 pounds. . . . The scientific world has already adopted the metric system, and the manufacturing world is coming to it much more rapidly now. There are additions every day to manufacturers who are using this system, either alternately or primarily with the old system as the alternate. The metric system would save the Government many millions of dollars."

Constantine E. McGuire, Assistant Secretary, United States Section, Inter-American High Commission: "We have had impressed upon us the constant amazement of the Latin-American officials and financiers that the United States of America has, as they put it, so long hesitated to take the step here suggested, that it make uniform its system of weights and measures with those legally in use thruout the world. In the course of my work it was necessary for me to go to South America. It has been said that there are many 'customary' units in use in the Latin-American countries. While that may be true in remote and isolated communities—it may be true to

some extent in regions that are not thickly settled or developed, among the population of Indian descent—it is certainly not true in the large cities, or in any kind of commerce that comes even indirectly in touch with international trade. It is not true in any of the computations with which bankers have to do, with which Government agencies have to do. Nowhere in the revenue laws of the 20 other republics in this hemisphere will you find any reference to 'customary' units; nowhere in the legislation enacted with respect to excise and inspection of goods, in the administration of pure-food laws, health laws, and the like, will you find any reference to other systems of weights and measures than the decimal metric system. Whenever there have been international gatherings of representatives of the American Republics to discuss the general problems confronting them all, this question has invariably come up and resolutions have been presented and adopted, to the effect that it was and is desirable that systems of weights and measures used currently in international commerce, should be uniform. The United States section of the Inter-American High Commission for which I am speaking here, has twice had the matter brought to its attention by other sections of the commission, and has adopted resolutions recommending the matter to Congress as of serious importance." (Mr. McGuire presented these documents to the Senate Metric Committee; and some of them may be found reprinted in Chapter 6 of this book.)

G. A. Sherwell, Juristic Expert, United States Section, Inter-American High Commission: "The adoption of the metric system will facilitate the development of both manufacturing industries and commerce, since it prevails all over the world with the exception of the English-speaking communities, in which, nevertheless, many industries have been forced by circumstances to make more and more frequent use of the metric system. For our manufacturing concerns to conform to the new measurements, perhaps in some cases adaptations would be necessary, but frequently no change would be required, for the substitution of the metric system would merely call for the adoption of a new nomenclature. Every progressive step in industry has met the same argument. Men are prone to get into ruts and never get out of them; yet they will, on reflection, not fail to welcome a measure which is obviously helpful. Any money spent for the installation or adaptation of machinery to conform to the new measurement would in the long run prove profitable thru an increase of production and greater facilities for foreign consumption of our manufacturing products. The metric system, once adopted, would prove its superiority by the readiness with which it would be understood by everybody."

Arthur P. Williams, R. C. Williams & Co., wholesale grocers, New York City; representing National Wholesale Grocers' Association of the United States of America; New York State Wholesale Grocers' Association: "The United States of America has become a world nation today, a world factor. We have adopted world methods. We manufactured war material in the metric system for the European countries when we gave them their guns, and so on. The metric system is known everywhere and used everywhere except in Britannia and the United States of America. Russia and Japan are taking it up. If I do business with Russia 5 or 10 years hence, which I probably will, I must deliver the goods over there in the metric system. Why not make the step? . . . I believe that with the introduction of the metric system, when all the thousands of unnecessary sizes would be eliminated and we could get down to a standardized can and a standardized

package, that the consumers of the United States of America would save millions of dollars."

Morris Eller, Inspector of Weights and Measures, City of Chicago, Illinois: "We believe that there should be a uniform system of weights and measures in use thruout the world in order that dealers could intelligently bid for trade in any place without having to go to the trouble and expense of reducing the weights and measures of one country to the equivalent of the weights and measures of their own country, and the expense of making up certain size packages or containers to market their goods for one country that could not be used in other places; and further to make possible the accurate checking up of the different purchases by the purchasers. The metric system is used in this country at the present time in scientific work and also in a number of factories where tools, machinery and so on, are made, and they find it just as easy to use this system as the old one and with a greater degree of accuracy." (The Chicago Board of Aldermen voted unanimously for metrics.)

Charles L. Parsons, Secretary, American Chemical Society: "The Anglo-Saxon race prefer the automobile today to the old oxcart which they formerly used, because of its superiority as a means of transportation; and the metric system is as much of an advance over the system that we have in effect today as the automobile is over the oxcart. Is it not better to have one system in use, which is the best system in the world, just the same as we have one money? The whole country would know the metric system and use it perfectly easily in a week. Therefore the transactions of everybody in the country—the farmer, the manufacturer, and the laboring man—would be greatly simplified. . . . I have talked with many, many of the officers of the Army and Navy who, having used it abroad, were strongly in favor of its adoption in this country. I think that you will find most of the expeditionary force who have actually used the metric system, officers and men, if they had a vote here today would vote overwhelmingly in favor of the adoption of the metric system by the United States of America. I feel very confident of that, because I have so far failed to come in contact with one who, having used it, was not in favor of its adoption."

H. W. Bearce, Division of Weights and Measures, Bureau of Standards, United States Department of Commerce: "There is a good deal of misapprehension as to just what is contemplated by the Ladd Metric Standards Bill. From the legal and technical definitions of 'goods, wares, and merchandise,' I take it that the sale of land, or other real estate, is not included under this bill. . . . I am of the opinion that the bill should pass, and that its passage would be a distinct advantage to the country as a whole. In the metric system the same name always means the same thing, whereas in our 'customary' system there is a confusion as to certain units; the quart, liquid and dry; the ounce, avoirdupois, troy and fluid; the ton, long and short. The coming generation of farmers are not going to be content to struggle along with an antiquated and cumbersome system. Many of them are already familiar with the metric system from using it in the Babcock test of milk and cream, and in soil and fertilizer analyses. To these young men the complete adoption of the metric system would be an easy step gladly taken."

Ben C. Dailey, President of the World Trade Club (Foreign Trade Club of San Francisco); Member of the Metric System Committee, Cham-

ber of Commerce of the United States of America: "Noted authorities have been quoted as saying that the World War was lengthened 2 years thru lack of thoro metric standardization amongst the Allies. Suppose that for this reason the war was lengthened only 2 months; what does that mean? It means this: During every month of the World War 100,000 men were killed, 200,000 were wounded or missing. Thus 2 months' delay meant the needless killing of 200,000 men, the needless maiming of 400,000 more. Thus were thousands of brave warriors 'linked irrevocably with the past,' when they might be here with us today in the present, if the United States of America had possessed the 'gumption' to scrap the obsolete standards with which it has long been encumbered and to take up instead the logical metric units adapted to modern world conditions. . . . The Ladd bill now before the United States Senate (S. 2267) ought to be passed as a measure to increase our national efficiency. Above all, it should be enacted as a measure of national defense, for it will go far toward putting the United States of America on a unified basis with the nations of the world in supply and co-ordination of war material."

Aubrey Drury, Executive Secretary, World Metric Standardization Council; Secretary, World Trade Club (Foreign Trade Club of San Francisco): "World traders as a unit want the United States of America to go onto the metric basis, for upon that basis today are conducted the majority of the world business transactions; and this will be increasingly so in the future."

Gaston Giraud, Commercial Attaché for French Indo-China in the United States of America; Member, World Trade Club (Foreign Trade Club of San Francisco): "Think of your experience in the late Great War. If you had had the metric system at the time you entered the war we (the Allies) should have been able to give you ammunition fitting your guns and rifles; and think how many lives would have been saved in that way. Furthermore, if all countries of the world had been standardized on the metric basis, the manufacturing of munitions for and in all countries would have been simple. . . . On the Pacific Coast in May, 1920, there was a great meeting with relation to the adoption of the metric system, and at that time many opinions were sent by prominent men abroad in favor of the metric system. I had the honor to read at the meeting declarations made by 2 prominent Frenchmen, Marshal Joffre and Marshal Petain. I have also talked the matter over with Marshal Foch, and he will give me a declaration along the same line. . . . As to trade between French Indo-China and the United States, in my official capacity in San Francisco I have seen many points of friction due to the difference in weights and measures between the 2 countries. Nearly all the railroad systems in China have adopted the metric system except one built by the British from Peking-Tientsin to Mookden. The Franco-Belgium Railroad, the Peking-Hankow line, was unable to get connection for freight and material with the British railroad because the standards of measurements were not the same."

F. W. Andrew, Chief Engineer, Eisemann Magneto Corporation, Brooklyn, New York: "I wonder if you understand what this metric system is going to do. It is going to throw out the Troy weight, which is used in measuring precious metals. It is going to throw out the apothecaries' weight; it is going to throw out our dry weights and measures; it is going to throw out liquid weights and measures; it is going to throw out the avoirdupois weight, which does not mean anything in export trade because

the British is different from ours. Their foot is a little longer than ours; their gallon is about 1/7th more than ours. When we speak of avoirdupois weight in this country, what is a ton? The coal man buys 2,240 pounds and sells 2,000. The metric system is going to throw out all those systems; and we are going to have one system. We are going to systematize our weights and measures like the shop that systematizes its methods of manufacture. . . . I believe that prosperity can not be revived to any marked extent until our export business has materially improved. There is no question in my mind but that the people to whom we export would like to use apparatus made by the metric system. I do not think that is open to doubt." (The Eisemann Magneto Company, which during the war furnished about 85% of the ignition for the United States war trucks, employs metric units extensively in manufacture.)

Roger W. Babson, President, Babson's Statistical Organization, Wellesley Hills, Massachusetts: "I am much in favor of the adoption of the metric system and I hope that the bill S. 2267 will go thru."

John Bassett Moore, eminent jurist; Member of the World Court: "I received a great deal of printed matter issued by persons opposed to the adoption of the metric system. I did not find it convincing, as the underlying thought seemed to be simply that of the care and preservation of what may be called vested interests in our present system. . . . I happened to know, from such information as I possessed, that some of the assertions were incorrect and misleading."

Fred J. Miller, President, American Society of Mechanical Engineers, 1920: "As I understand it the proposed bill (S. 2267) permits any manufacturer to use within his own works any system he may prefer, and that it is only in his dealings with other people or with the public that he must use the metric system. I believe this feature of the bill eliminates the last feature to which valid objection can be made by anyone."

William G. McAdoo, wartime Secretary of the Treasury of the United States of America; Director of Railroads; eminent jurist: "I would be glad to appear before the committee in behalf of the adoption of the metric system, if it were not for the pressure of professional matters in New York. I have always felt that the adoption of the metric system would very greatly enlarge our trade in Latin America and in all countries where the metric system is in effect."

Dorr E. Felt, President, Felt & Tarrant, manufacturers of the Comptometer; member, Board of Directors, Chamber of Commerce of the United States: "Senate bill 2267 has been called to my attention and I write to express my sincere hope that a law making the use of the metric system compulsory after a very limited number of years may be passed by Congress. I am quite well aware that many manufacturers are opposed to the introduction of the metric system. That is to be expected. The human race is very reluctant to change to better methods, especially where it involves even a little bit of learning something new. It seems to require a trip hammer to effect any general movement in the line of progress. I am quite conscious of what would be necessary to adapt our machinery and drawings and train workmen for the use of the metric system, but am willing to make that change, which would not be serious either from the standpoint of expense or loss of efficiency during the transition from the old system to the new."

Herbert T. Wade, technical editor of the New International Encyclopedia: "Those to be benefited most by the adoption of the metric system are the so-called plain people, who today are ignorant of its advantages and for whom there should be legislation that will simplify the problems of their daily life and improve their condition and small business relations. For industry in general it would seem to be only a matter of time when the metric system comes into use in the United States as a part of more efficient management and accounting. Furthermore, there is a growing realization that irrespective of the merits or demerits of the metric system the American 'system' of weights and measures based on the British has little to commend it. . . . Let me assure you this work is for the people; and as far as I have observed most of the opposition has come from certain special interests and a few wealthy manufacturers personally rather than the public at large."

E. D. Horner, General Manager, Commercial Union of America, New York City: "In reference to bill S. 2267, to secure the use of the metric system of weights and measures thru the United States, we appreciate keenly the necessity for a unifying of the systems of measuring. We wish every success to the undertaking, which, we feel, is a very worthy one. A large portion of our business is with foreign countries where we are obliged to make quotations in the metric system."

While it was indicated at the Senate Hearings that all branches of the Army and Navy have not as yet united in advocacy of the metric units, many of them issued statements which deserve to be quoted:

Bureau of Medicine and Surgery, Department of the Navy, thru F. L. Pleadwell: "This bureau is unequivocally in favor of Senate bill No. 2267—a bill to fix the metric system of weights and measures as the single standard of weights and measures for certain uses. In the exact sciences the conveniences of the metric system have resulted in its universal adoption. In this respect it is already an international system, and the worker who attempts the use of older and more cumbersome systems finds himself in difficulties. The advantages of the metric system will eventually cause it to be universally adopted, and the main objections at the present time are the cost of transition in commercial fields and the lack of general familiarity with the new system. The reasons for the advance would ultimately more than counterbalance initial financial loss. Dealers in scientific supplies have managed to survive the change. The legally mandatory metric system would stimulate education. We legally and successfully abolished a complex system of coinage more than a century ago. Why not apply the same principle to our system of weights and measures?"

Bureau of Supplies and Accounts, Department of the Navy, thru David Potter: "In principle, the Bureau of Supplies and Accounts is in hearty favor of the establishment of a metric system of weights and measures."

Bureau of Yards and Docks, Department of the Navy, thru C. W. Parks: "The Chief of the Bureau of Yards and Docks is heartily in favor of the adoption of the metric system. It is believed that an exception should be made for repairs and replacements of articles purchased or constructed prior to the date that this act goes into effect."

Marine Corps, Department of the Navy, thru John A. Lejeune, Major General Commandant: "The change to the metric system would be very difficult and very expensive as far as material is concerned, but from a purely military standpoint it would be advisable." (It is proposed, however,

wherever material has to be changed under S. 2267, that this be done over a 10-years transition period, minimizing any expense or difficulty.)

Lieutenant-Colonel E. E. Peck, Ordnance Department, United States Army; from article on "Gauging": "There is a consistent and steady forward movement toward an international standard and there is no doubt but what the near future will see rapid strides in this direction. The **World War** has done more to help this movement than all the propaganda of the last decade. It has shown in a very practical way the **delay, trouble and cost** of producing necessary material to a number of different standards. It has shown that a very great world economy will result in the adoption and use of international standards. It must be evident to everyone that all business and commerce will be done with less expense for the service rendered if standard specifications were in use and had the same meaning all over the world. If steam and water pipe, bolts, nuts and screws were interchangeable in every country it would promote business and effect an economy greater than any one thing now before the public."

Chief of Engineers, United States Army: "The Army should adopt the metric system only if adopted by the country as a whole, and in adopting it should do so in its entirety."

Field Artillery Board, United States Army: "From letters received from, and from interviews with, a considerable number of Field Artillery officers, the consensus of opinion appears to be decidedly in favor of the meter as the linear unit of measure. Some reasons for this are that most Field Artillery officers have become accustomed to using this unit; that its subdivisions and multiples are based on the decimal system; that the meter is the linear unit in most other countries and to some extent for scientific purposes in this country; that practically all instruments in use in the Field Artillery are now graduated in meters; and that the change back to graduations in yards would be costly. Specifically, the Field Artillery Board recommends (1) That the metric system of linear units and units for range table data be adopted for the Field Artillery and that the adoption of the metric system for the Army be recommended. (2) That metric scales, grids, and contour intervals be used on all military maps, or, if this is found impracticable, that at least graphic scales in meters and 1,000-meter grids be placed on all military maps. (3) That steps be taken to induce the other arms of the service and the staff to adopt the meter as the linear unit of measure; and (4) That other services of the Army which furnish data of any kind to the Field Artillery be requested to furnish the same in terms of metric units."

Chief of Field Artillery, United States Army: "Strongly in favor of the adoption of metric units for the graduations of ordnance and for the scales of maps. The study of all European operations in the future will necessarily be done under this system."

Chief of Coast Artillery and Chief of Field Artillery, United States Army, in joint memorandum: "The desirability of the standardization of units of measurement used in the service, as well as the standardization of the method of graduating all service instruments and weapons is clearly recognized. . . . It is specifically recommended that the metric system be adopted for all mobile artillery other than railway."

Commandant, General Staff College, United States Army (Major General McAndrew): "The advantages of handling metric units and tables, and transforming to English units when desired, are considerable, and that would be preferable to changing existing (metric) equipment. It is recom-

mended that the using of the metric system for range tables and range-finding instruments in the computation of firing-data for both mobile artillery and machine-guns be prescribed."

Commandant, Cavalry School, United States Army: "It is the unanimous opinion of the school staff (1) That the metric system should not be adopted in the Army until it has been adopted for the Nation by Congress; (2) That such adoption by Congress is highly desirable."

Commandant, Infantry School, United States Army: "A subcommittee of the advisory board reports (1) That if a change is to be made and a change is recommended, this is the logical time. (2) That the use of the metric system is permitted in most civilized nations, including Great Britain and the United States. (3) That the adoption of this system, the logical system, has advantages that need not be enumerated, but may be compared with our present monetary system. . . . The Commandant states (1) That all seem to agree that the metric system would be preferable for use of our entire country; (2) that the adoption of the metric system by the Army at this time when it is starting on its work of vocational and educational training would add considerable to the efforts that are being made by educators thruout the country to establish the metric system in our schools; (3) that in spite of the difficulties attendant upon the adoption of the system at the present time, they are not insuperable; that the final results would be a betterment of work in the Army and encouragement to the entire country, and therefore he favors the adoption of the metric system for the Army."

Construction Division, United States Army: "As an organization the Construction Division believes that the adoption of the metric system by the United States for all commercial purposes would be most desirable. The Army should adopt the metric system only when it has been made the official system of the Government by proper Congressional action."

Signal Corps, United States Army: "The metric system should be adopted by the entire Army. . . . International co-operation in meteorology is becoming more and more necessary. The metric system is used at present in obtaining and disseminating meteorological data to the several arms."

Ordnance Department, United States Army: "The mobile Artillery now uses the metric system exclusively for ranging measurements except for weight of projectile."

John Paul Jones, Captain, Ordnance Department, United States Army: "The Ordnance Department, in the World War, (7 July, 1917) asked the advice of representative tool and gauge manufacturers regarding the advisability of manufacturing the matériel having metric thread and gear systems, and inquired as to the availability of tools for making such work to the metric system. Such concerns as Greenfield Tap & Die Co., Ideal Tool & Machine Co., Jones & Lampson, Brown & Sharpe, and the Geometric Tool Co. all replied to the effect that while the stock supply of metric taps, dies, twist drills, milling cutters, and small tools was more limited than the supply of English tools they were in a position to furnish these tools in the international metric system in all standard sizes and would accept large orders for 60 days' delivery. Bethlehem Steel Co. and several representative rolling mills were questioned as to the advisability of specifying plates in metric thicknesses. The Ordnance Department received advice that in view of the fact that the quality and tonnage of plates required were such as to demand special rolling there would be no appreciable difference in the time of

delivery between plates rolled to metric dimensions and to English dimensions. In view of the foregoing information it was decided to use the metric system thruout, and Ordnance Office drawings for the 155 millimeter howitzer, model of 1918 (Schneider), and 155 millimeter gun, model of 1918 (Filloux), were prepared accordingly. From the point of view of the drafting room this decision probably saved 6 weeks to 2 months actual time in the preparation of drawings, because the drawings were exact duplicates of and in many cases traced from the French drawings."

George P. Blow, President, Western Clock Company, La Salle, Illinois; member, American Committee on Standardization, International Chamber of Commerce: "I should like to put myself strongly on record as favoring S. 2267 as a wise, conservative, and constructive measure, and as an example of the best type of statesmanship. I believe the introduction and use of the metric system is absolutely necessary if we are going to retain any of our fast disappearing foreign trade, and that there is no question now before Congress of more importance than the passage of this bill.

"Bill S. 2267 removes each and every objection urged against the metric system by the opponents. It very clearly and explicitly states that it does not necessitate any change in threads of nuts, gauges, or other machinery or appliances for manufacturing; and hence does not entail the expense of millions in the installation of new machinery; as persistently claimed by its opponents. Finally, it allows more than a liberal time for everyone to readjust themselves to the new system before it becomes compulsory.

"I am convinced that the change can (and will) be made without confusion in less than one year. All that the manufacturer wishes to know is that the 'Government is going to make the change.' Each factory will then go ahead promptly and will not wait 10 years before he joins the procession of progressive manufacturers who have already changed to 'metrics.'

"The argument that our people will be confused, or be backward in learning the new (?) system (as so frequently stated by the antimetric propagandists), is a deliberate insult to the intelligence of our citizens, and should be shown up as such. Surely, if all the other 41 nations that have adopted 'metrics' can master its alleged intricacies, the free-born, public-school educated American can have no difficulty in doing so. If the inhabitants of our colonies (who are not considered 'able to govern themselves'), the Philippines, can master and use it intelligently our school-trained people can do so. If the Costa Rican, the Cuban, the Russian, the Pole, the Japanese, can understand and use it, an American citizen (surely his equal in brain power and education) should have no difficulty.

"I am heart and soul for the bill and my recent trip abroad as a delegate to the International Chamber of Commerce has only confirmed previous convictions in its favor. It is, of course, only human nature to be conservative and to 'hold back' against a change, but the opponents of a measure so important to the business success of our country are taking on their consciences a great responsibility when they use their time, money, and abilities to hold back or defeat such a measure of usefulness."

W. Mortimer Crocker, representative of the World Metric Standardization Council, and of the American Metric Association, in Washington, D. C.: "The farmer would welcome a uniform, single system of weights and measures, so that when he was buying or selling a ton of wheat he would know exactly what he was doing. He is confused now. For instance, there are 56 different kinds of bushels, which affects the farmer right straight thru. If

the thing was explained to the farmer, as to the advantages of the metric system, he would fall right in line."

Howard Richards, Secretary, American Metric Association, New York City, New York: "As to the practical use of the metric system and its advantages: the measures of length lend themselves with special readiness to practical everyday transactions. This is shown first by the elimination of fractions. Instead, for instance, of speaking of 5/16 of an inch we speak, in dealing with machinery, of 8 millimeters. If a man's stride is 80 centimeters, in 10 steps he covers 8 meters; in 100 steps he covers 80 meters. This calculation, and similar ones, are only possible by the use of a simple decimal system. The method of measuring areas is also so convenient that it appeals to the farmers, people who have the task of planting. For instance, if 50 grains of wheat are needed for one square meter, for one square kilometer 50,000 grains are needed. In no other system is this convenience possible. The method of measuring volume is even more convenient. As one cubic centimeter of water weighs one gram, one cubic meter of water weighs one metric ton; and similar calculations are also facilitated. It is strikingly practical."

W. W. Keen, Philadelphia, Pennsylvania; former President, American Medical Association, American Philosophical Society, and of the College of Physicians of Philadelphia: "It is only by getting people in all departments of life to think in meters, liters, and grams, instead of our archaic system at present in use, that we can eventually hope to make it universal. The present time is eminently favorable to the introduction of the metric system in this country and in Great Britain as well. Two million of our soldiers have been in France and are familiar with the kilometer, the meter, the gram, the metric ton and other metric weights and measures. In addition, a very large number of our manufacturers have been constructing locomotives, making ammunition, and very many other kinds of manufactures by the metric system. I very sincerely hope that the Britten-Ladd Bill will be passed."

Henry D. Hubbard, Secretary, Bureau of Standards, United States Department of Commerce: "We can not ignore what other countries have done and what the sciences in the world have done. All the sciences in the world, whether physics, chemistry, biology, or medicine, have adopted the metric system; that is universal. So it occupies a place in that tremendous group of human activities which, as we all know, are making the future, so far as both industry and technology are concerned. It seems to me that we have got to take into account not only what science has done, but what other nations have done—nations having all the ranges of intelligence, from those of France and Germany to those of China and Japan. Since the war there have been 5 nations added to the 34 which had made it the legal system. Those nations were not compelled by any external power to adopt the metric system. They did it because they needed the best system, and we need the best system. If 39 nations have adopted it there must be a most excellent reason."

Justin W. McEachren, representing Crane Company, Chicago, Illinois: "If Crane Company did not believe that there was a big, broad, general benefit to be gained from this, not only for the United States, but for the world at large, we would not favor it. But we do favor it now, because we see that it is inevitably coming. It has been coming step by step right along. Today industry, business, and individuals are not content to just let things drift.

They want to help along what they think is worth helping. If it is good, let us have it quickly. If it is beneficial where it has come into effect—and we believe it would be beneficial here—why wait a generation or 2, but let us further it all we can and give greater benefit not only to ourselves but to those that follow us. In other words, we are working for the future. We believe we could do business better and do more of it. I believe we could bring the people of the United States in contact with the peoples of the world easier.

"Being in a position to receive and to read about everything that is printed and distributed on this question, both pro and con, it is our deliberate judgment that interest in the general adoption of the metric system, to the exclusion of all other existing systems, has grown steadily and now is widespread; and that many individuals and organizations, and even industries, are working, as we are, independently and in their own way to secure the advantages of the general use of the metric system, not only for our own country but for all the countries of the world. I have not been able anywhere to find any sign of retrogression. Where once the metric system has secured a foothold, it not only has held that advantage, but has made progress. I believe, and Crane Company believes, its ultimate general exclusive use is inevitable.

"The metric system has been steadily, slowly, but surely, and with not a single backward step, drawing a circle of 3 simple little words around the world. The circle is now complete save for the gap in which stands as a bar to progress, the United States and Great Britain.

"While those 3 words (meter-liter-gram) are simple and little, they are big enough and strong enough to bear the burden of the commerce and industry of the world, no matter to what proportions they may go."

Additional testimony in behalf of the World Metric Standards is constantly being placed before Congress, and much of this is reprinted in the official records of the Hearings. To this testimony the reader is referred.

The reader is referred also to the printed records of Hearings held in former years. Excerpts from the testimony laid before the United States Congress in 1879, 1896, 1897, 1898, 1901, 1902, 1906, 1907, and other years are contained within the present volume, especially in chapter 10, "What Will Metric Standardization Cost?" Hearings before the British Parliament are also referred to; and the notable British Parliamentary Report of 1862 is reprinted as Chapter 12 of this book.

It would be unworthy of us to ignore the pre-eminent humans who gave testimony which led to practically all civilized nations using the metric system. Heed should be given to the counsel of known advocates of world standardization since the days of James Watt—men like George Washington, Thomas Jefferson, James Madison, Benjamin Franklin, Alexander Hamilton, Charles Sumner, and other great men, up to the present time. Consideration should

be paid, also, to the arguments which convinced the 40 large nations now using the metric units satisfactorily. This testimony may be found in copious abundance in the libraries of the world.

Surely, all should at least read such testimony before objecting to Progress.

And, when all have been convinced that this metric advance should be made forthwith, they should impress this upon their national legislators. Metric standardization is now before Congress; and it should be kept prominently before Congress until the metric advance is achieved. All are urged to write their national legislators to work for the Metric Standards Bill, providing for a gradual progress to exclusive use of metric units in merchandising after a transition period of 10 years.

CHAPTER 9

WHO URGES METER-LITER-GRAM?

Practical Men

TO give all the statements of support for world metric standardization would be to pass in review the representatives of 99% of humankind.

A few of these statements are here presented. They are typical of the virtually unanimous support that has been given the movement to secure the advantages of simple, decimal, standardized weights and measures, in the place of our present antiquated jumble of unstandardized units, inherited from the old German Hanseatic League—a jumble which Germany scrapt in 1871.

It will be apparent that only a comparatively small number of endorsements of the metric units can here be printed, when it is remembered that on file with the United States Department of Commerce alone there are more than 103,000 such endorsements. There are 10,000 letters in the files of the World Metric Standardization Council urging metrics, and thousands more in the files of the World Trade Club, American Metric Association and other organizations participating actively in the worldwide metric movement. A selection from these statements has been made to indicate the support of metric standardization by manufacturers, merchants, engineers, agriculturists, authors, educators, physicians, jurists, clergymen, accountants, men of the army and navy, and so on. Virtually every branch of human activity is represented.

The statements given in this chapter are mainly individual statements from representative persons in the United States of America, tho a few are included from other countries to show the trend of world opinion upon this important point. Endorsements by organizations in the United States of America, and thruout the world, have been already printed in Chapter 6, "Organized Effort for World Metric Standardization."

Opinion favoring metric standardization in the British Isles and other Britannic countries is presented in Chapter 11, "Metric Movement Thruout Britannia." Statements urging the metric units, made by organizations and concerns and individuals thruout Britannia, are concentrated in that chapter to show conclusively

that all the British countries are ready now to make the metric advance.

Consult the Index

It should be emphasized here that the reader should consult the Index to gain a more complete answer to the question, "Who Urges Meter-Liter-Gram?" The present chapter consists entirely of statements of support, but thousands of similar endorsements are printed elsewhere in this volume. For instance, the 2 preceding chapters, "The World Metric Standardization Council" and "Metric Legislation Before Congress," are full of strong metric testimony; and the chapter, "What Will Metric Standardization Cost?" is largely made up of authoritative statements from hundreds of business experts. Chapter 14, "Look It Up," likewise cites numerous statements in behalf of metrics, and indicates where thousands of others can be found.

For convenient reference, the material in the present chapter has been arranged in a number of groups, according to the vocations of the individuals quoted. Almost always they speak the opinions of the majority in those vocations. It ought to be pointed out, moreover, that various categories (such as manufacturers, world traders, educators, engineers, agriculturists, organized women, and so on) have declared their support of metric standardization thru their national and local associations. These declarations of various groups will be found in Chapter 6, "Organized Effort for World Metric Standardization." In the present chapter, the statements are arranged as follows:

INDEX TO GROUPS

	Page
Pre-Eminent Americans	182
Leaders of the World Disarmament Conference, 1921-22	186
Manufacturers and Merchants	189
Engineers, Architects, Accountants	213
Scientists and Inventors	219
Physicians, Surgeons and Pharmacists	222
Agriculture and Forestry	224
Army and Navy	231
Bankers and Banking Institutions	234
Insurance	236
Lawyers and Jurists	237
Clergy and Religious Congregations	240
Educators	242
Authors, Artists, Editors, Publicists	251
Publications, Periodicals, Newspapers	254
Officials and Legislative Bodies	262
Typical World Opinion on Metric Standardization	269

PRE-EMINENT AMERICANS

Thomas A. Edison, world's greatest inventor: "I have for years been in favor of the adoption of the metric system and would like to see it substituted for our present jumble."

Luther Burbank, world's greatest grower: "The metric system, if adopted by the whole world, will, without doubt, simplify the science of weights and measures beyond computation."

Henry Ford, world's greatest manufacturer: "We heartily approve of any step toward the adoption of the metric system in our industries. It appears there is no better time than now."

Elwood Haynes, President, Haynes Automobile Company; President, Haynes Stellite Company; great inventor; builder of first automobile in America: "I very decidedly favor the adoption of the metric system. I think that the Britten-Ladd Metric Standards Bill is quite practical; and think that the 10-years transition period is plenty of time."

Alexander Graham Bell, Telephone Inventor: "Congress did well in abolishing the old system of pounds, shillings and pence and adopting the decimal system for our money; and we will do well for the future of our country if we provide the metric system for the whole of the United States of America."

John Bassett Moore, eminent diplomat; member of the World Court: "I have long advocated the adoption of the metric system for the purpose of securing uniformity in the use of weights and measures thruout the world."

William G. McAdoo, eminent jurist; wartime Director of the Railroads and Secretary of the Treasury, United States of America: "A very great stimulus indeed would be effected by our accepting the metric standards of industry, education and science, now in use thruout the world. Shall we in this striking instance fail to adjust ourselves to the requirements of progress?" (See other statements of William G. McAdoo; consult Index.)

L. S. Rowe, Director-General, Pan-American Union: "The United States loses business in Latin America because of persistence in using customary weights and measures in exports which are not understood and do not fit in with the industrial economics of the Latin Americans. In effect, we are trying to sell left-handed tools to people who are right-handed."

William C. Redfield, when United States Secretary of Commerce, addressing the Philadelphia Chamber of Commerce (10 January, 1917) said: "The fact, of course, is that the metric system adopted exclusively by 34 nations is simpler, easier, more effective, and more widely used than any other. It has made its way by its

merits. There is no argument for the retention of our present weights and measures that is not an argument against our decimal metric dollar system. No reason supports our decimal dollar system of currency that does not support decimal system of measure. This handicap we must throw off, get out of the darkness—out of foolishness toward reason." (See other statement by William C. Redfield; consult Index.)

Theodore Roosevelt, Assistant Secretary of the Navy (29 March, 1921): "I am delighted to say that I approve of the gradual adoption of metric weights and measures by the United States of America."

Franklin D. Roosevelt, when Acting Secretary of the Navy (14 May, 1919): "I have always favored adoption of the metric system by this nation. I believe the time is ripe for concerted action to push this thru."

Admiral William S. Sims, United States Navy (7 July, 1921): "I need not say, I am sure, how much I am interested in any measure or movement which will tend to bring the English-speaking peoples into closer and more intimate relations and understanding; and to this end it would seem to me that the introduction of the metric system as a common system of weights and measures would exert very considerable influence in this direction. As to the many advantages of an international standardization, based upon the decimal system for all weights and measures, it is generally understood that this would greatly simplify, facilitate and reduce the expense of making plans and calculations, and of conducting commercial transactions. It therefore seems to me that, from every point of view, the advantages of the adoption of the system in question would greatly outweigh the inconvenience and expense involved in making the change."

Admiral W. S. Benson, when Chairman, United States Shipping Board: "There is every advantage to gain from the metric system, and nothing to lose. The only reason that I can consider that has operated to prevent its earlier adoption is inability to overcome the mental inertia of those who have to take action in this matter."

John Barton Payne, eminent jurist; former Chairman, United States Shipping Board; Director of Railroads; United States Secretary of the Interior: "The value of the metric system of weights and measures has been demonstrated and these units should be adopted by the United States of America. They are much more simple than our present cumbersome weights and measures."

Albert D. Lasker, Chairman, United States Shipping Board (7 July, 1921): "The use of the metric system is continually increasing, and I feel that sooner or later the United States will be compelled

to adopt this system. The metric system is, in my opinion, a necessary reform, and must be adopted by the United States within the future in order that our business operations may be conducted in an intelligent way, and I feel that the sooner its adoption is brought about in this country the better it will be for the country."

General John J. Pershing, Commander-in-Chief of American Expeditionary Forces in the World War; Chief of Staff, United States Army: "The experience of the American Expeditionary Forces in France showed that Americans were able readily to change from our existing system of weights and measures to the metric system. I think the principal advantages of the metric system are summed up in the fact that this is the only system which has a purely scientific basis. Not the least advantage of the fact that the metric system is based on scientific principles is the facility which that system gives to calculations of all kinds, from the simplest to the most complex. I believe that it would be very desirable to extend the use of the metric system in the United States to the greatest possible extent."

General Leonard Wood, Governor-General of the Philippine Islands (21 January, 1921): "I am very hopeful that the question of Metric Standards for weights and measures will be worked out on some consistent plan which will put into effect its well-known advantages."

Charles W. Eliot, President Emeritus, Harvard University: "The adoption of the metric system by the United States of America would greatly reduce labor in trades because of the thorough decimal quality of the system, and would facilitate teaching of mathematics and applied sciences in schools."

Arthur T. Hadley, when President of Yale University, New Haven, Conn. (2 September, 1919): "I believe that metric units are likely to come into more and more general use."

Nicholas Murray Butler, President of Columbia University: "The adoption of the metric system by English-speaking people would advance world trade as it already has advanced science."

Henry Van Dyke, author and recent U. S. American Ambassador to Holland: "I am in favor of the standardization of the measuring systems of the world by the adoption of the decimal basis, under conditions which will cause the least possible disturbance to trade."

Otto H. Kahn, great financier: "I favor unified world standard of weights and measures on the basis of the metric units of meter-liter-gram."

James Speyer, world banker: "I am in favor of any measure that will unify trade and education in all parts of the globe. Therefore I am in sympathy with the effort to have our country adopt metric units. I think this ought to help our business men and facilitate intercourse and trade, especially with South American countries."

Hudson Maxim, Maxim Park, Landing, New Jersey: "I believe that there should be a universal standard of measure, and that the United States Government should adopt the metric system, but I believe that we should still employ the system of aliquot parts—that we should use eighths, quarters, halves, etc."

Judge E. H. Gary, President of the United States Steel Corporation, stated after looking over the Stratton report urging the adoption of metric units[1] that "he would like very much to see this report published and spread broadcast."

John Hays Hammond, mining engineer, wired World Trade Club from Washington, D. C. (14 May, 1919): "I endorse metric system as the universal standard. I am convinced from an intensive study of international commerce that the adoption of the metric system would greatly facilitate promotion of the export trade of America."

Scores of other statements from the most eminent Americans, and from the most eminent of humankind, are to be found in this book. Among those who voice their approval of gradual metric standardization for the United States of America are Arthur E. Kennelly, David Starr Jordan, General Hunter Liggett, Albert Bushnell Hart, John Barrett, Samuel Gompers, William J. Bryan, John Spargo, George E. Vincent, Roger Babson and many others.

Pre-Eminents of the Past

For years, those of wide vision in the United States of America have been working for metric standardization. In other parts of the present volume, their statements have been given, and lack of space prevents reprinting them here. The reader is referred to Chapters 8 and 14 for metric statements by **George Washington, Thomas Jefferson, James Madison, John Quincy Adams, Charles Sumner** and other great statesmen. Some of those who have more recently urged meter-liter-gram are the following:

Andrew Carnegie: "The metric system of weights and measures is one of the steps forward which the Anglo-Saxon race is bound to take." (See Carnegie's signed statement in Chapter 4.)

George W. Perkins, Chairman of the Executive Committee of the United States Steel Corporation; organizer of the International

[1] See Chapter 2.

Harvester Company (20 May, 1919): "Believing it to be in the best interests of the unity and progress of the civilized nations of the world, I heartily endorse the proposal for adoption of metric units by the Anglo-Saxon peoples."

Theodore N. Vail, Chairman of the Board, American Telephone and Telegraph Company, controlling more than half of the telephones and telegraphs of the world (20 May, 1919): "I fully endorse movement for exclusive use of meter-liter-gram."

Colonel Theodore Roosevelt, President of the United States of America, is quoted as saying in regard to the Metric System: "We must have it!"

Franklin K. Lane, United States Secretary of the Interior (10 February, 1920): "I am in full sympathy with the movement to make America metric."

Champ Clark, leader in United States Congress (2 September, 1919): "I have always been in favor of the metric system."

W. C. Gorgas, Major-General, United States Army; with Rockefeller Institute, International Health Board: "I am strongly in favor of Metric Units and will be glad to assist in having their adoption brought about."

Theodore C. Search, Founder and President of the American National Association of Manufacturers, said before Congress (1904): "Whenever manufacturers undertake to extend trade outside the United States of America and the British Commonwealths they encounter meter-liter-gram, the only weights and measures uniform thru all the world."

LEADERS OF THE WORLD DISARMAMENT CONFERENCE

1921-1922

Leaders of the various national delegations at the great World Disarmament Conference, Washington, D. C., United States of America, have come out unqualifiedly in favor of world metric standardization. Typical statements are here given, showing that the world is unanimous in the desire to secure promptly the advantages of metric uniformity of weights and measures:

UNITED STATES OF AMERICA: **Elihu Root,** of the American delegation; eminent jurist; Secretary of War, 1899-1904; Secretary of State, 1905-1909; U. S. Senator from New York, 1909-1915; declares: "I am in favor of keeping up the process by which the world may ultimately come to a general employment of the metric system."

BRITISH COMMONWEALTHS: **Arthur James Balfour,** chief of the British delegation; pre-eminent British statesman: "There can be no doubt, I think, whatever, that the judgment of the whole civilized world, not excluding the countries which still adhere to the antiquated system under which we suffer, has long decided that the metric system is the only rational system."

FRANCE: **Aristide Briand,** President of the French delegation; Prime Minister of France (16 November, 1921): "I firmly believe that a single worldwide system of weights and measures would prove a surprisingly important factor in promoting a better understanding among the nations of the world. Naturally, it is my hope that the international metric system of weights and measures, which has already been made the single system by practically 40 nations of the world, will eventually become the single official system of all peoples. I am very happy to learn that the American Congress is now considering the adoption of the international metric system of weights and measures for the people of the United States."

JAPAN: Statement by the Japanese Delegation (26 November, 1921): "Last April a law adopting the international metric system as the single standard of weights and measures was passed by the Imperial Diet of Japan, and it was publicly announced that the date of its enforcement would be promulgated by an Imperial Ordinance. This action was taken after a thoro investigation, made by a special commission to simplify our standards of weights and measures. We were unofficially informed that the United States and Great Britain were also planning to adopt the metric system and it is our personal hope that the time will soon come when this uniform system will be universally adopted by all the countries in the world."

(Signed) **T. Kato,**
Tokugawa.

Admiral Baron Tomosaburo Kato, Minister for the Navy (President of the Japanese Delegation);
Prince Iyesato Tokugawa, President of the House of Peers.

ITALY: **Carlo Schanzer,** President of the Italian Delegation; Senator of Italy (17 November, 1921): "Italy adopted the international metric system of weights and measures many years ago and has since rejoiced over this achievement which has increased our national efficiency and facilitated our commercial relations with a number of other countries. Italy is proud to be the home of the International Institute of Agriculture created by our King and supported by a number of countries of the world including the United States, and which carries on all its work on the metric basis.

I believe that eventually the international metric system will be the single standard for all countries of the world. This to my mind will be an important step in human progress. Furthermore, the great number of Italians who have met with so generous a hospitality in the United States will find in the adoption of the metric system a new link which will bind them still more to the old Latin civilization and which will give them not only material benefits but great moral advantages."

CHINA: **Sao-Ke Alfred Sze,** President of the Chinese delegation; Minister of China to the United States of America (7 December, 1921): "In 1914 the Republic of China promulgated a Weights and Measures Law which established a dual system, one being the standard metric units which is in use in so many countries, and the other being our own system of measurement which has been in force in China for so many centuries. You can of course realize the difficulties which we have encountered in making changes from our old system to the new, but it is my understanding that the modern metric system is gradually coming into use, especially upon the railways. I am of course thoroughly in sympathy with a plan that would provide for general standardization of weights and measures thruout the world."

BELGIUM: **Baron E. de Cartier de Marchienne,** President of the Belgian delegation; Ambassador from Belgium to the United States of America (1 December, 1921): "Belgium adopted the metric system as far back as the end of the 18th century, and economically, as well as scientifically, has derived from it great advantages. One readily understands this fact when one remembers the difficulties which complicated the most usual commercial relations between the inhabitants of the different provinces of old Belgium where various standards of weights and measures existed. I am convinced that, when the metric system will have become common to all civilized nations a true progress will have been achieved."

HOLLAND: **Jonkheer H. A. Van Karnebeek,** President of the Netherlands delegation; Netherlands Minister of Foreign Affairs; President of the League of Nations Assembly (12 December, 1921): "Holland has long realized the value of the international metric system and adopted it. I am confident the increasing volume of international trade tends to intensify the inconvenience of the simultaneous application of different standards and makes for uniformity. World commerce outgrows more and more the codes of individual countries and demands with ever stronger emphasis rules

of universal scope. I believe this is particularly true in regard to weights and measures."

PORTUGAL: **Viscount d'Alte,** President of the Portuguese delegation; Minister of Portugal to the United States of America (7 December, 1921): "Portugal was one of the first countries that adopted the metric system, in the year 1868. In a few years the system became so popular that now the old standards dating, some from the time of the Romans and some being much older, are nearly forgotten, everybody feeling happy to use a rational interconvertible system of weights and measures. For my part I anticipate great advantages from uniform standards in all nations."

MANUFACTURERS AND MERCHANTS

The greatest manufacturers and merchants in the United States of America have come out strongly in favor of gradual metric standardization. There are 15,501 petitions from manufacturing concerns, manufacturers and their engineers on file with the United States Department of Commerce, urging metric standardization. These petitions represent concerns with an aggregate invested capital of several billions of dollars. Some of the typical statements, from among these thousands, are the following:

Allied Chemical and Dye Corporation (capitalized for more than $300,000,000), thru Wm. H. Nichols, Chairman, 61 Broadway, New York City (16 March, 1921): "This corporation, like all other chemical institutions, is in favor of the metric system, and I personally have been more or less active in furtherance of the matter for some time past. I am aware of the objections to the change, but believe that the difficulties in making it would be found to be very much less than many of its opponents believe."

Ford Motor Car Co., thru Henry Ford, President: "We heartily approve of any step toward the adoption of the metric system in our industries. It appears there is no better time than now." (Manufactures more than 60 per cent of all automobiles in the United States of America.)

Goodyear Tire & Rubber Co., thru P. W. Litchfield, Vice-President (1920): "We are heartily in favor of the international metric standard." (The Goodyear Co. now makes extensive use of the metric units and announced its decision to adopt them exclusively.)

Crane Company (59 branches; manufacturers of about 20,000 articles, steam specialties), thru R. T. Crane, Jr., President: "We

have for 10 or 12 years advocated the metric system, which we thoroughly believe in."

United Light and Railways Co. (19 subsidiary operating companies), thru R. Schaddelee, Vice-President (18 March, 1921): "Our organization is strongly in favor of the introduction of the metric system in our country, and we do not care who knows it."

Simmons Co. (large manufacturers of iron and steel articles; Simmons beds, so on), thru O. B. d'Aoust, Secretary: "We do not hesitate to give our indorsement for the adoption of the rational metric units." The President of this concern, Zalmon G. Simmons, is a member of the Advisory Committee of the World Metric Standardization Council.

Emerson-Brantingham Co. (large manufacturers of agricultural implements, gas and steam engines, carriages, sawmills, and so on), thru A. T. Jackson, Vice-President, Rockford, Illinois (16 March, 1921): "We authorize you to go ahead and list our concern as being entirely favorable to the metric movement and ready to support its activities."

Morris & Co. (large packers and provisioners), thru Theodore Sanders, Chicago (10 January, 1921): "In reference to the metric system: this movement has our sympathy and moral support."

Miller Rubber Co. of New York (incorporated for $60,000,000), thru C. E. Wagner, Export Manager: "We have signed petitions for the adoption of metric weights and measures."

J. B. Brady, General Manager, Pacific Coast Division, **United States Rubber Co.** (incorporated for more than $100,000,000), San Francisco, California: "You can rest assured of my sympathy with this movement you are undertaking."

Chas. A. Mead, Vice-President, **E. I. du Pont de Nemours & Co.**, Wilmington, Delaware (24 January, 1921): "Of course in our chemical work we are on a metric basis at the present time, altho our machines and equipment as a rule are not. There is no doubt but that we shall steadily extend the use of the metric system in all our work."

E. N. Brown, President, **National Railways of Mexico**, 120 Broadway, New York City: "I will be very glad to do what I can to further this metric work, believing that it is in the interests of all and that it is a much simpler system than our present system of weights and measures."

Samuel Vauclain, President, **Baldwin Locomotive Works** (annual sales, $80,000,000): "We could change to the metric system, or we could use both systems, without incurring any appreciable expense at the time. My opinion, however, is that were we all

using the metric system it would be much more convenient to the workmen, and our errors would be appreciably less than they are at present."

James W. Cain, Vice-President, **United States Fidelity and Guaranty Co.** (incorporated for more than $25,000,000), Baltimore, Maryland: "This is a subject to which I have given much thought and attention, and I am firmly of the conviction that we should without further delay take such steps as are necessary for the introduction of the metric system as the legal standard of weights and measures."

Edward Prizer, President, **Vacuum Oil Co.**, New York City (surplus, $57,646,000): "The advantages of the metric system I quite appreciate, particularly in view of the fact that in our foreign operations we are necessarily obliged to use it in whole or part."

George W. Dickerman, Vice-President, **Remington Typewriter Co.**, New York City: "The writer believes thoroly in this simple, logical system of measurements and of weights and would like to see it adopted."

International Textbook Co. (giant world concern owning the capital stock of the International Correspondence Schools, and so on), thru Rufus J. Foster, Chairman, Executive Committee, Scranton, Pa. (1 October, 1920): "As an institution, we are heartily in favor of the adoption of the Metric System."

Waltham Watch Co., thru Conover Fitch, Vice-President, Waltham, Mass.: "The Waltham Watch Company adopted the Metric System in 1868, about 12 years after the establishment of the Company, and has used it exclusively ever since. We have found it much better for our needs and have done everything we could to advance its adoption."

Hammond Lumber Co. (incorporated for more than $10,000,000), thru A. B. Hammond, President, San Francisco, Calif.: "We favor the promotion of world trade and national efficiency thru metric standardization of weights and measures. We urge that the metric units be made the exclusive legal standards of weights and measures within the jurisdiction of the United States of America."

Shredded Wheat Co., Niagara Falls, New York: "We urge that thru legislation or promulgation the units of the metric system of weights and measures be made the exclusive legal standards within the jurisdiction of the United States of America."

Kellogg Toasted Corn Flake Co., Battle Creek, Mich. (21 March, 1921): "We favor metric standardization of weights and measures and we trust its adoption is not far distant."

Certain-teed Products Corporation (large manufacturers of paint, roofing and related building products), thru R. M. Nelson, Treasurer: "We are in favor of this (metric) movement."

Hydraulic Pressed Steel Co. (large manufacturers of standardized steel articles), thru G. C. Brainard, General Manager: "We are firm believers in the metric system of measurement and believe that its universal adoption would very materially simplify and facilitate all computation in connection with our manufacturing business."

J. B. Williams Co. (shaving and toilet soaps and toilet articles), thru E. B. Hurlburt, Glastonbury, Conn. (29 March, 1921): "We most heartily favor a change to the Metric System, and we are aware that a departure of this sort entails a certain amount of inconvenience and more or less irritation, but we are confident that the gain to be made will be immeasurably greater than any inconvenience incident to the change."

Diamond Crystal Salt Co., thru R. R. Moore, Vice-President, St. Clair, Michigan (28 March, 1921): "We will be glad to be listed among those American manufacturers advocating the adoption of metric units during a gradual transition period."

Williams & Cunnyngham, thru V. L. Cunnyngham, Treasurer and Manager, 78 East Madison Street, Chicago, Ill.: "We represent advertising of concerns whose business represents more than a billion and a quarter annually. We recommend that the Meter-Liter-Gram method be adopted."

Briscoe Motor Corporation (large manufacturers of motors and munitions), thru Victor Jantsch, engineer, Jackson, Michigan: "Our opinion is that the metric system is a coming system of measurement, as it is already used generally in the scientific laboratories, and in medicine and also is in general use for electrical measurements. We firmly believe that it will be only a matter of a few years when the metric system will be adopted for general use." [Now Earl Motors Co.]

Roxana Petroleum Co. of Oklahoma, thru S. Petersen, St. Louis, Mo.: "We are strongly in favor of the campaign for world standardization of weights and measures thru the adoption of metric units by the United States of America."

Victor Animatograph Co., Davenport, Iowa: "We are heartily in favor of the adoption of such a universal standard, which would be of great assistance to our photographic department."

Truscon Steel Co., thru Julius Kahn, President: "We thoroughly sympathize with and desire to encourage metric standardization." (See also statement of Vice-President Page of this company.)

Standard Steel Car Co. (large manufacturers of automobiles, and so on), thru A. Christianson, Chief Engineer, Butler, Pa.: "We are heartily in favor of the adoption of the metric system of weights and measures thruout the world." (He sent testimony to Congress to this effect.)

Tacony Steel Co. (large manufacturers), thru W. F. Mulhall, Philadelphia, Pa.: "The universal adoption of the Meter-Liter-Gram system can only be accomplished by Congressional action, which action can just as well be initiated now as it will inevitably be in the future."

Elwood Haynes, President, **Haynes Automobile Co.; Haynes Stellite Co.:** "With all of America's up-to-date methods we are still disgraced and burdened with an antiquated system of weights and measures. The time for changing to the metric system can never be better than now. The same objections to making the change now were urged 40 years ago." (See also his testimony before Congress, printed elsewhere.)

E. C. Danner, Superintendent Order Department, **Cambria Steel Co., Johnstown, Pa.:** "I am strongly in favor of the Metric System and will gladly co-operate with any reasonable plans your Standardization Council may formulate."

Lazard Kahn, Vice-President, **Estate Stove Co.** (large industrial concern), Hamilton, Ohio, 17 March, 1921: "American adoption of metric standardization for weights and measures would be an act of business engineering and statesmanship whose large economic, financial and moral benefits cannot be logically doubted or reasonably computed. Practices in national or international trade which invite and do not eliminate confusion and misunderstanding are in fact retarding the achievements sought for."

Albert Herbert, for many years President and Treasurer of Leolastic, and Director of **Everlastik Corporation;** Chairman of the Standardization Committee, American Delegation, International Chamber of Commerce, 1920: "It is surprising that metric standardization was not brot about long ago. No one objects to it except a microscopic minority."

De Laval Separator Co., thru T. H. Miller, Works Manager, Poughkeepsie, New York, 16 March, 1921: "This works adopted the Metric System some 12 or 14 years ago in all its designs of machinery and parts and has used it ever since to its great advantage, which is, of course, most marked in studies and calculations leading to designs. The cost has been nothing that could be found. It was, of course, not necessary to throw away any designs already existing, but merely to express dimensions in the Metric

System and it was not necessary to scrap any machinery or tools, in spite of the claim that such necessity is one of the great disadvantages." (See his testimony before Congress.)

J. G. White Engineering Corporation, thru Gano Dunn, President: "Formerly somewhat prejudiced against the Metric System, we have changed our point of view on account of finding it convenient, simple and less liable to error in drafting and specification, so that we now welcome it and would be glad to see its universal employment."

Jas. Inglis, President, **American Blower Co.** (large fan, blower and engineering business): Tho Mr. Inglis formerly opposed the adoption of the metric weights and measures, he has now come to favor metric standardization. This is typical of many manufacturers, who formerly had not thoroly "looked it up." Mr. Inglis writes: "I shall be pleased to be counted among those who are favorable to the passage of the Metric Standards Bill." Speaking of a meeting of the executive and engineering heads of the American Blower Co., Mr. Inglis said: "On the whole the adoption of the metric system was favored."

Curtiss Engineering Corporation, thru Glenn H. Curtiss, President, Garden City, New York: "I have no hesitancy in endorsing the adoption of metric units as standards. It would certainly be a great boon to Science, Art and Industry."

Poole Engineering and Machine Co. (large industrial concern), thru A. S. Baldwin, Chief Engineer, Baltimore, Md.: "We are strong believers that universal standard measurements should be adopted and that the metric system is the proper one."

A. Stein & Co. (manufacturers of Paris garters), thru T. E. Parry, Chicago, Ill., 6 May, 1920: "We are earnestly in favor of seeing the metric system used as a standard all over the world."

Western Clock Co. (makers of "Big Ben" and other world-famous "Westclox"), thru the Board of Directors, Peru, Illinois, 8 November, 1921:

"WHEREAS, there is in the United States a deplorable lack of uniformity in weights and measures, and the units are unscientific, cumbersome, and unrelated, constituting an actual hindrance to education, industry, world trade, and the activities of daily life, and

"WHEREAS, the metric system of weights and measures is a decimal system, simple, logical and easy to use, so that its adoption will result in an incalculable saving in time and energy; and

"WHEREAS, the metric system has been adopted by the vast majority of enlightened nations, and its adoption by the United

States is calculated to promote friendly relations and commerce with all the world; and

"WHEREAS, the manufacturing industries of the State of Illinois and the country at large are particularly interested in the adoption of the uniform and universal system of weights and measures known as the Metric System in order to facilitate production and to hold and improve world trade, therefore be it

"RESOLVED, That the Board of Directors of the Western Clock Co. strongly advocates the passage of Senate Bill 2267, known as the Ladd Bill, as a just, wise, conservative and constructive measure and respectfully urges that the units of the metric system be adopted by the Congress of the United States as the legal standard of weights and measures after a transition period of 10 years, as proposed in bills now before Congress."

(This is submitted as a sample, for other industrial concerns to use.)

Automatic Electric Co., thru Grant Pelton, Vice-President, Chicago, Illinois (9 May, 1921): "The metric system is needed by the industries of this country and we hope that the bill will pass for the following reasons:

(1) The present system of weights and measures is non-decimal and places upon us a burden of calculations and tabulated data which the metric system removes, and a ceaseless vigilance against error due to the composition of the units which the metric system greatly reduces.

(2) The metric system is made up of units which are naturally related to each other by decimal relations—the system is completely homogeneous. It reduces the mental labor in measuring, weighing, computing and recording and reduces the probability of error.

(3) Our research department has been using the metric system exclusively for a number of years, both in research and in design, and has found that it is vastly superior to the old system.

(4) We propose, as soon as it can reasonably be done, to convert our entire factory to the metric system, not changing any of our dimensions, but simply measuring them in metric units. We have surveyed our factory by departments, to see what changes are necessary and are surprised at the small cost which it involves.

(5) We employ 3,000 people and are growing.

(6) We have experimented with teaching the metric system to people and have found that it is picked up with great ease and speed." (See testimony of Automatic Electric Co. before Senate Metric System Committee.)

A. B. Farquhar, President, **A. B. Farquhar Co., Ltd.** (manufacturers of farm implements and heavy machinery), York, Pa.; Vice-President, Chamber of Commerce of the United States; author, "My 64 Years in Business": "The metric theory is sound in principle, and is therefore bound to prevail sooner or later."

Atlas Ball Co. (now of S. K. F. Industries), thru W. F. Shellinger, Superintendent, Philadelphia, Pa.: "After years of experience in manufacturing precision balls for ball bearings, we think it would be a great advantage to American and British industry if the metric system of measurement were adopted in the United States and the United Kingdom, practically the only 2 countries where the metric system is not in general use."

George Schuhmann, Vice-President and General Manager, **Reading Iron Co.** (large manufacturers of wrought iron pipe, and so on), Reading, Pa.: "The use of the antiquated systems is time-consuming, uncertain and nerve-racking. For the average daily practice the metric system is much easier on one's mind, and a still greater mental labor saver to those who have to calculate much in volumes and weights."

Liondale Bleach, Dye & Print Works, Inc. (large manufacturers), thru S. J. Loewenthal, Rockaway, N. J.: "We understand that movement is under way to secure the adoption by our government of the universal use of the metric system. We are very much in sympathy with a movement of this character, as we feel, as manufacturers, that it would greatly simplify the handling of our product, especially in foreign markets."

M. H. Hopkins, President and General Manager, **O. & W. Thum Co.** (manufacturers of Tanglefoot Fly Paper, and so on), Grand Rapids, Michigan (26 March, 1921): "The writer personally favors a gradual adoption of the metric standard."

Dow Wire & Iron Works, thru W. H. Logan, President, Louisville, Ky.: "We are heartily in favor of the metric system."

Lucey Manufacturing Corporation (large manufacturers of pumps, engines, drilling tools, and so on—12 branch offices), New York City: "We have endorsed exclusive use of the meter-liter-gram."

Frank C. Munson, President, **Munson Steamship Lines,** New York City (10 February, 1921): "I am in favor of the introduction of the Metric System and will do what I can to influence legislation in that direction."

Hamilton Watch Co., Lancaster, Pa.: "There is an effort being made to have the United States Government adopt metric weights

and measures, and we take this opportunity to say that in our opinion this would be a great convenience."

Chase Metal Works (large manufacturers of sheet and tubing), thru W. B. Fairfield, Waterbury, Conn.: "The undersigned endorses any activity that will bring about the exclusive use of Meter-Liter-Gram by the United States of America."

B. T. Babbitt, Inc. (large manufacturers of soap, washing powder, and so on), thru L. S. Bernheim, Treasurer, New York City: "We know from long experience the great advantage of the decimal system in coinage, and it is very apparent that the advantage will be fully as great in the matter of weights and measures."

Charles Cooper & Co. (large manufacturing chemists and importers), thru R. J. O'Grady, New York City: "We endorse any activity that will bring about the exclusive use of the metric system by the United States of America."

E. Ingraham Co. (large manufacturers of clocks and watches), thru D. S. Ingraham, Bristol, Conn.: "We take this occasion to endorse any legitimate ways and means that will bring about the exclusive use of Meter-Liter-Gram by the United States of America."

Ludlow Valve Manufacturing Co. (large manufacturers of high pressure valves, fire hydrants, and so on), thru J. H. Caldwell, President, Troy, N. Y.: "We favor exclusive use of Meter-Liter-Gram by the United States of America."

Habicht & Co. (large manufacturers of bakers' supplies), New York City: "We are in favor of the world-wide use of Metric Units."

B. F. Nelson, **B. F. Nelson Manufacturing Co.** (large manufacturers of building paper, and so on), Minneapolis, Minn.: "I have been for several years very much in favor of the adoption of the metric units in place of the present ungainly system which we are using."

Beech-Nut Packing Co., Canajoharie, N. Y.: "We are in favor of the metric system."

Celite Products Co., New York, Chicago, Pittsburgh, Los Angeles, San Francisco, thru H. H. Krieger, General Manager: "Such work as you are doing is unquestionably of very great value. We wish you well."

American Insulated Wire & Cable Co., thru M. B. Mervis, Secretary, Chicago, Ill.: "We are very much in favor of this move."

R. H. Long Co. (manufacturers of boots and shoes and shoe machinery), Framingham, Mass.: "We believe that if the metric system can be universally adopted that it will result in much benefit to the whole world."

Baltimore Canning Co., Baltimore, Md.: "We think it is time our country was awakening to the necessity of using the Meter-Liter-Gram."

Litchfield Manufacturing Co., Waterloo, Iowa: "We have taken action in favor of metric standardization of weights and measures."

P. D. Wagoner, President, **General Vehicle Co., Inc.** (large manufacturers of electric and commercial gasoline automobiles), Long Island City, New York: "The mechanics prefer the metric system, having once used it. In addition, most American shops have an appreciable percentage of foreign mechanics who have been trained to use the metric system in their native country."

C. K. Anderson, President, **American Wire Fabrics Co.**, Chicago, Ill.: "We have had considerable business from various countries that are now using this system, and we frequently have put up goods under the meter measurements; and as all countries except the United States and the British Isles are using it, why should not the English-speaking people and merchants have the best?"

National Oil Products Co., thru F. Fader, Purchasing Agent, Harrison, N. J. (2 November, 1921): "We believe this is a very good and worthy movement."

Getz Bros. & Co., Inc. (large exporters and importers), thru M. G. Franklin, Treasurer, San Francisco, Cal. (2 April, 1921): "Thru dealing with all parts of the world, we find that our domestic standards of weights and measures are a distinct disadvantage. We shall welcome the day when the metric system is finally adopted by our country."

Thomas Spacing Machine Co., thru G. P. Thomas, President, Pittsburgh, Pa.: "We are manufacturers of heavy machinery and we believe that the universal system of measure based on the metric system is essential. Nothing but blind prejudice and unwillingness to learn a new system stands in the way of its adoption."

Carl E. Schmidt & Co., Tanners, thru N. J. Schorn, Detroit, Michigan: "Regarding the estimated cost, I cannot comprehend any such figures as some of the advocates of the obsolete system present. As far as we are concerned, if the Congress were to make the metric system the only legal system tomorrow, we would merely change our graduations on the beams to fit the less complicated system." (See testimony of David Molitor, of this concern, before Congress, 1921.)

American Bosch Magneto Corporation, Springfield, Massachusetts; thru P. R. Mayer, Superintendent: "Our entire manufacture is based on the metric system. The argument that the introduction of the metric system thruout the United States would

revolutionize our industries and entail 'colossal losses' **is sheer nonsense.** It will, however, be cheaper to the Country to introduce the system now, instead of waiting another decade. It should be borne in mind that 50% of the difficulties have been already overcome by the very fact that the system is now being taught in our primary schools and on account of its well-nigh exclusive use in scientific laboratories thruout the Country. To my mind, there is nothing in the way of an immediate adoption of the metric system except the removal of the entirely unfounded fear of some short-sighted people. . . . To be sure, the manufacturer is the one that has to consider seriously the adoption of the metric system sooner or later. The sooner, however, the better—and the cheaper. We are the makers of the Bosch magneto, a product which is universally known; and the success of the Bosch magneto is in no small measure due to the metric system. . . . Regarding the changing over of machine tools, this is only necessary where actual metric readings are required. These machines are mostly used in Tool Rooms and represent not more than 10% to 15% of the equipment of any manufacturing plant. Even among the 15%, it will be found that some machines, especially lathes, are equipped to work to metric dimensions, thus cutting the cost of change down further. It becomes apparent at once that the 'colossal losses' are over-estimated and should really be termed negligible."

California Wire Cloth Company, thru C. Zook Sutton, Vice-President, San Francisco (12 March, 1921): "We have watched with increasing interest the efforts of the World Metric Standardization Council to stimulate to realization the dormant mind of the average American business man relative to the great possibilities awaiting us in the form of metric standardization. The potential good to be derived therefrom has as yet not been conceived even by the most ardent enthusiasts, nor will it be manifest until we have actually had the opportunity of trial, of putting it to daily use. Then only will we awake to the stupidity of having closed our eyes to this simple, inexpensive, time-and-money-saving factor, conceded by most commercial nations to be of absolute necessity. In our own business we are daily wasting time and money converting our obsolete inch, foot, yard and rod units to square measure, and vice versa. The same economic loss is being carried on in hundreds of thousands of American institutions, and will continue until such time as we adopt and make exclusive the use of the 'metric standard of weights and measures.' Our views on this subject are the results of a careful investigation which has been made in our line with the idea of decreasing production costs and overhead. The advantages

referred to in the use of the metric system are not idealistic predictions, but are based on concrete facts, and a year's application of the system by the writer while serving in the capacity of Captain of Artillery with the A. E. F. (Having grown familiar with the use and advantages of the metric system as a battery commander in France, I find it difficult and anything but efficient to work with the old English system.) If the bill now before Congress passes, I venture to say that only a small fraction of the 10 years allowed will be required to demonstrate the simplicity, efficiency and importance of the metric system."

Graham Roller Bearing Corporation, Coudersport, Pa.; thru D. F. Graham, Sales Engineer (10 January, 1921): "We certainly favor the gradual adoption of metric standardization of weights and measures in the United States, and will do all in our power to further same. We use the metric system entirely. It is impossible for the writer to believe that the cost of changing (for the country at large) would be very great, for the reason that at the start dimensions could be given in millimeters and decimals, holding to the present sizes and dimensions of parts and material. It would be the easiest thing in the world to gradually change to metric dimensions as time went on; and we find that there are practically no dimensions used today in even inches where any accuracy is required, but that all dimensions resolve themselves in inches and fractions, usually 1,000ths of an inch. This can just as well be given in millimeters as in inches. It would of course mean some very careful, earnest work to be done by the Engineering Department of the various factories, but as far as the factory itself is concerned, we believe that the change could be made with almost no break whatever."

Peerless Color Company, Bound Brook, N. J., thru R. W. Cornelison, President and General Manager (1 February, 1921): "I wish to express myself as very favorable to the metric standards bill. It is not drastic legislation which would make our measuring machines and standards antiquated, but the transition is to be brot about in a period of 10 years. There are a lot of 'old fogies' who oppose the metric system. . . . The transition for the manufacturer is not so great as he at first might suppose. With the metric system, there is no inconvenience and much less liability to error."

Matthiessen & Hegeler Zinc Company, smelters and manufacturers, La Salle, Illinois; thru the President (26 November, 1921): "The business interests of the United States of America would be greatly benefitted by the Britten-Ladd Bill (H. R. 10-S. 2267). We

feel that it can be only a matter of a little time when a measure of this kind will be approved."

W. R. Grace & Company, thru M. Bouvier, Secretary, some years ago declared: "All the Latin-American countries use the metric system of weights and measures, and we find it necessary to convert our pounds, yards and gallons into the equivalents of the system understood in the section to which the goods are shipped. Of course it would simplify matters a great deal if we used the metric system in the United States. As it is, we buy here in one system and sell abroad in another. A uniform system would save a great deal of labor."

Sargent & Company, New Haven, Connecticut; also New York and Chicago; announce in the National Hardware Bulletin, November, 1921: "The unit or **decimal** system of pricing and packing hardware, which we have adopted and are now using for our product, appeals to most of our customers, and its adoption has met with their hearty approval. We received many letters of approval from leaders in the industry, while resolutions of indorsement were received from trade associations. Advantages of the Decimal System: It saves time, reduces labor and lessens the liability of error in sales and accounting work by simplifying the mathematical operations necessary to arrive at a price. This change in trade methods is a great advance that will be more and more appreciated as it is used and its use is extended."

Meyer Scale and Hardware Company, Newark, N. J. (14 May, 1919): "As manufacturers of weighing equipment in all standards known thruout the civilized world, we unhesitatingly recommend and advocate the exclusive use of 'Metric System.' We feel that this is the psychological moment for its adoption by the great English-speaking nations of the world, in order to facilitate the intercourse between ourselves and all other parts of the world, which, as is well known, have already adopted the Metric System."

Fred B. Strunk, General Storekeeper, **Dahlstrom Metallic Door Company,** Jamestown, N. Y. (25 November, 1919): "My work as General Storekeeper of a steel products manufacturing plant has convinced me that the only way to get away from our present complicated and cumbersome system of gages, weights and measures is to use only a common-sense method, the metric system."

Tabor Electric Company, Red Wing, Minn. (2 June, 1919): "It is the writer's opinion that ***no one act of legislation could confer a greater benefit*** on the commercial industries of the nations of the world than the standardization of the Meter-Liter-Gram unit."

George P. Blow, President, Western Clock Company, LaSalle, Illinois; member, standardization committee, International Chamber of Commerce (19 November, 1921): "The Metric Standards Bills (H. R. 10; S. 2267) were specially drawn to meet the objections of **some** manufacturers, who have been convinced (by opponents of 'Metrics') that **any change** of system would involve scrapping of tools, dies, nuts, bolts, machines, and other appliances; and thus cause the expenditure of 'millions of dollars.' For this reason, it is provided **specifically**: (1) That the change shall apply to purchase and sale (merchandising) and **not** to any method, tools, or appliances used in fabrication or manufacture; (2) that ample time (10 years) be given to prepare for, and adopt the new system; (3) that exception may be made for goods intended for foreign countries using the old system (Great Britain and colonies). It will be seen, therefore, that manufacturers are more interested, (and have received more consideration) than any other group of citizens; and it is hoped and believed that they will show their appreciation by prompt action in their approval and endorsement."

O. L. Lewis, Chief Engineer, **Southern Motor Manufacturing Association, Ltd.,** Houston, Texas; formerly Chief Engineer, Tractor Department, Moline Plow Company, Moline, Illinois (24 February, 1920): "The losses of time, if the present system is continued in use, will extend indefinitely thru hundreds and hundreds of years, amounting to a mass of energy that is unthinkable in this age of efficiency, while the inconvenience caused by the change to metric units will be of short duration. The writer has been connected with educational projects, shop management and engineering since 1904 and feels that considerable agitation against the metric system is due to near-sighted business policy, rather than the consideration of the real merits of the case."

Hawkeye Wrench Company, Marshalltown, Iowa; thru H. E. Woodward, Manager (26 April, 1920): "We are very much in favor of metric standardization of weights and measures. We feel that the added convenience and time-saving features of this system would very much more than offset the costs of changing over our present system. This could be taken care of gradually by discontinuing the old system of measurements when making up new tools and in adding new lines."

Lionel Hagenaers & Co., New York City (8 May, 1919): "We are much in favor of the metric system." (Lionel Hagenaers, head of this world trade concern, is President of the Belgian Chamber of Commerce in the United States.)

American Sponge & Chamois Co., New York City (26 July, 1919): "We are heartily in accord with the metric system."

Godfrey L. Cabot, great manufacturer; owns 5 factories and works; built Grantsville Carbon Works, West Virginia (largest in world); Vice-President, Carbon Black Association; world aviation authority (17 February, 1920): "Once adopt the metric system and our commercial supremacy is assured."

Cutter & Wood Supply Co., 68 Pearl St., Boston, Mass. (2 May, 1919): "For 30 years we have been supplying to manufacturers of machinery and mechanical specialties our various lines of mechanical goods, precision tools, so on. While we realize that a radical change in the present measuring system would seriously inconvenience temporarily these manufacturers, owing to the necessity of changing tools, jigs, measures, so on, we feel certain that in the end a change by the U. S. America to a universal decimal standard of computation would be a constantly increasing source of advantage." (The Britten-Ladd Bill provides a gradual transition, not a radical change, with all interests protected.)

G. H. Duncan, of the **Annett Box Co.**, East Jaffrey, N. H.: "The desirability of bringing about the use of meter-liter-gram was particularly called to our attention today when we were figuring the cost of a partitioned lining for a box, the lining consisting of splints 18 in. x 13/16 in. x 1/16 in. and other pieces 12½ in. x 5¼ in. x 1/16 in.; and it was necessary for us to find the amount of lumber in 12,000 of the smaller pieces and 5,000 of the larger pieces. Of course, it was possible to do this. As a matter of interest, we found that it required about 220 board feet of lumber, but we could not help thinking how much simpler it would have been to have figured this in decimal fractions of a meter. These problems are arising in hundreds of thousands of industrial plants every day; and it would be a tremendous saving of time the country over were the metric system established as the universal standard."

H. Seydel, President of the **Seydel Manufacturing Co.**, Jersey City, N. J.: "There seems to be some sentiment in favor of retaining the archaic system of weights and measures that we are now burdened with. Having been raised in Belgium the writer is well acquainted with the metric system, and can only say that in Belgium 9 people out of 10 know the size value of whatever is put before them, whereas our business experience has been that very, very few of the men we employ could ever be taught the comparative values of the obsolete system we now have, which system we believe is somewhat the cause of the difficulties we experience in the exportation of our products."

M. Weill, President of the **Illinois Smelting & Refining Co.,** Chicago: "We have addressed legislators so hot that we nearly burned the paper. I think the only way to get the metric system is by money. *I am willing to subscribe $100 for the purpose and there should be 1,000 others if not 10,000 who would give from $10 to $10,000 if they are at all wise, and get the money back in a year; yes in a month by the saving accomplished.* What is everybody's business in Congress is nobody's business." *Letter to World Trade Club,* 20 December, 1919.

Du Pont Food Products Co., Baltimore Md., thru **A. F. Du Pont** (15 May, 1919): "We use exclusively the metric system in our factory—the work is much more accurate and scientific. As you will see in the enclosed circular, we have an extensive export trade. Outside of the British colonies, nobody bothers with such an obsolete system as the English avoirdupois."

A. J. P. Bertschy, President and General Manager, **Bertschy Engineering Co.,** Cedar Rapids, Iowa (12 January, 1921): "We are manufacturers of a high-grade machine tool. We are catering to the foreign as well as domestic trade. I feel rather silly when I stop to think that I am sending one of our machine tools manufactured according to American standards to a foreign customer, and ultimate user. Furthermore, if the average machine tool manufacturer would take the time or stop long enough to check carefully over the tracings or blue prints affecting his product he would himself become confused. Not once has he been able to rid himself of the complex situation which arises, regardless of how careful and efficient the organization is. We deal now in 64ths, 32nds, 16ths, 8ths, 4ths; and when our engineers desire to specify a tolerance, they cannot refer to it as 64ths, they must therefore specify 1000ths. Again, we have to use the drills in 64ths, and so on down the line until we have accumulated a large stock of tools, saying nothing about the fixtures and jigs, but referring only to drills, reamers, taps, and similar other standard or manufactured tools **which could be reduced by ½ if the metric system were adopted.** Therefore, the statement made by some that the metric advance would be expensive is not founded upon actual facts. I consider it of vital importance that the present system be entirely eliminated. I will be glad to assist in every way possible to bring about this advance which will be as great a benefit to America as any improvement or invention that has ever become of commercial value."

Morgan Drug Co. ("Success" remedies), thru R. G. Meggy, Export Sales Manager, and approved by Charles O. Johanot, President, Brooklyn, New York: "We hereby add our appeal to that of

others who believe that legislation should be adopted by the United States—the greatest country in the world—to improve its efficiency as such. Tho the greatest country in many respects, it is still fettered in others. It is fettered in dealings with most of the other nations—bound by ties of its own adoption—bound by ties which cannot but circumscribe its efforts and increase its difficulties, not merely at home but especially in its dealings with other nations.

"To teach its young the simplest operations in connection with weights and measures—part of the vital fluid of business—it still inculcates in their minds a confusion of tables, which are each, not only hard to remember (in comparison with what could and should be taught), but also are not connected by any system of common sense. The units of one kind of weight differ entirely from that of another kind and the same is true in connection with measures, whereas by learning the basic principles of metric equivalents in connection with one measure or weight, the student can understand that of all others.

"If the present confusion were unavoidable—if there were no remedy, such a state of things must necessarily continue, but no thinking man can say, with truth, that such is the case.

"If a man has an ulcer, which threatens his very existence and which can only be removed by a major operation, he goes to a surgeon and has that operation performed, no matter what the cost, no matter how intense the pain.

"Should not therefore a Nation, with such an ulcer, be willing to go to any expense, to have it removed? In order that such Nation may cease to be the laughing stock of other and smaller Nations, with larger brains for that principal subject. It would be at no sacrifice of national pride; and the cost would soon be more than balanced by future benefits derived.

"The writer is an engineer, a corporate member of the American Society of Civil Engineers—and knows that he is not suggesting something which is impossible of fulfillment.

"Many years ago it was found necessary to equip all the freight cars of the country with airbrakes and, although the cost was enormous, it was done. Not by arbitrary legislation, compelling an immediate change, but by gradual evolution extending over a period of several years.

"The writer therefore suggests that such a course be pursued in connection with the national ulcer under discussion. The government found it necessary to adopt the Metric System (in some of its operations) in order to co-operate more fully with its Allies in the war. We would therefore suggest that it finish its work and

create legislation making the **metric system** the legal and only method to be used as standard after a future date, as near to the present as may seem advisable.

"Individual action is practically out of the question and legislation making such a change compulsory would, while possibly appearing arbitrary to the unthinking, be a national blessing."

It has already been mentioned that more than 15,000 manufacturers and engineers have petitioned the Congress of the United States of America to enact metric standards legislation. In the Congressional Metric Hearings of 1907 (p. 58) the statement is made:

"Analysis made of the numerous petitions urging the metric units and presented to Congress shows that the great majority of the signers are practical business men. A card index containing 1,674 names of petitioners in the business section of Manhattan shows that of these 61 are machine and tool makers, 398 are general manufacturers, and 695 are merchants."

A list of all the manufacturers and merchants urging gradual metric standardization would take up many volumes. Here are a few chosen at random from among the very largest concerns in the United States of America:

George C. Scott, Vice-President, United States Steel Products Co., 30 Church St., New York City. (27 April, 1920.)

John C. Runkle, Vice-President, Barrett Co. (large manufacturers of roofing, building paper, and so on), Boston, Mass.

M. B. Kelly, President, American Steel Co., Park Building, Pittsburgh, Pa. (20 April, 1920.)

C. B. Van Dusen, Vice-President, S. S. Kresge Co.; Detroit, Michigan. (Gross sales in 1920 were $51,245,000.)

Carbondale Machine Co., 1325 Manhattan Building, Chicago, Ill.

Ruud Manufacturing Co. (large manufacturers of heaters, and so on), Pittsburgh, Pa.

Runkel Bros. (chocolate and cocoa), thru M. Fieux, Secretary, New York City. (1 February, 1921.)

Dalton Adding Machine Company, thru James L. Dalton, President, Cincinnati, Ohio.

Charles B. Stretch, Director and General Manager of Everlastik Corporation (rubber textiles manufacturers), New York City.

J. D. Dort, President, Dort Motor Car Company, Flint, Michigan.

Globe-Wernicke Company, Cincinnati, Ohio.

Bond Foundry & Machine Company, thru M. T. Williams, Managing Director; Manheim, Pa.

Pierce, Butler & Pierce Manufacturing Corporation (manufacturers of steam and water boilers, and so on), thru C. F. Bennett, Secretary, New York City.

John L. Whiting-J. J. Adams Co., Boston, Mass.; manufacturers of Whiting-Adams Brushes; brush manufacturers for over 112 years and the largest in the world. (Employ metric units extensively.)

D. Auerbach & Sons (large candy manufacturers), New York City.

Anglo-American Mill Co., thru L. F. Little, President; Owensboro, Ky.

Douglas Fairbanks Pictures Corporation, thru J. Fairbanks; Hollywood, California.

Louis A. Riley, President, Lehigh & Hudson River Railway; Philadelphia, Pa.

Charles A. Schieren Co. (large tanners and manufacturers of belting), thru Jay Zeamer, New York City.

Los Angeles Soap Co. (large manufacturers), thru C. B. Bergin, Vice-President, Los Angeles, Cal.

Littauer Bros. (glove manufacturers), New York City.

Chess & Wymond Co. (large manufacturers of staves, and so on), thru W. Avery, Louisville, Ky.

Mershon, Eddy, Parker Co. (manufacturers of doors, window frames, and so on), thru A. H. Hempstead, President, Saginaw, Michigan.

Dayton Steel Foundry Co., thru P. W. Klinger, Chief Engineer, Dayton, Ohio.

Borden Co. (manufacturers of "Beaver Quality Tools"), thru A. F. Howe, Vice-President.

Holland-St. Louis Sugar Co. (manufacturers of granulated sugar), thru W. Kremers, Superintendent, Decatur, Ind.

Sterling Products Co. (large canners), thru C. F. Hartmetz, President, Evansville, Ind.

Diamond Chain & Manufacturing Co., thru G. M. Bartlett, Chief Engineer, Indianapolis, Ind.

American Zinc Products Co., thru C. W. Martin, President, Greencastle, Ind.

Federal Rubber Co., thru J. M. Tait, Assistant Treasurer, Cudahy, Wis.

Wadhams Oil Co., thru E. N. Kullman, Treasurer, Milwaukee, Wis.

Western Grip and Trunk Co. (manufacturers of luggage), thru F. Stockhome, Secretary-Treasurer, Milwaukee, Wis.

L. C. Smith & Bros. Typewriter Co., Syracuse, New York.

Jewett & Sherman Co. (importers and manufacturers of coffees, teas, spices, and so on), thru Lewis Sherman, President, Milwaukee, Wis.

Fuller-Warren Co. (manufacturers of stoves, and so on), thru C. McCullough, Secretary, Milwaukee, Wis.

Cereal Products Co. (large manufacturers), thru F. A. Miller, General Manager, Manitowoc, Wis.

Pacific Car & Foundry Co. (large builders of standard railway equipment and supplies), thru O. D. Colvin, Vice-President and General Manager, Seattle, Washington.

E. H. Long, District Superintendent of Plant, Pacific Telephone & Telegraph Co., Oakland, Calif.

Paul Shoup, Vice-President, Southern Pacific Railroad Co.; President, Pacific Oil Co., San Francisco, Calif.

E. G. Burkland, President, N. Y., N. H., & H. R. R. Co., New Haven, Conn.

Hammond Typewriter Co., New York City.

E. Kaufman & Co., (steel manufacturers), New York City.

W. H. Olin, Supervisor, Denver & Rio Grande Railroad, Denver, Colo.

Inland Machine Works (manufacturers of machine tools), St. Louis, Mo.
The Pompeian Company, Cleveland, Ohio.
Burroughs Adding Machine Co.

Following is an alphabetical list of manufacturers and merchants, typical of the many thousands who urge gradual metric standardization. It is taken mainly from World Trade Club booklet 4, "Who Urges Meter-Liter-Gram?"

Accurameter Mfg. Co., Dr. F. Reichman, President, St. Louis, Mo.; Acme Packing Co., Chicago, Ill.; Adams Axle Company, Findlay, Ohio, G. M. Carter, President; Adams Seed Co., W. C. Adams, Treasurer, Decorah, Iowa; Air-O-Flex Automobile Corporation, Detroit, Michigan; Alberto de Verastegui, Managing Director of Export, Babcock & Wilcox Co., New York City; Alco Automatic Light Co., J. A. Hillstrom, V. P., Minneapolis, Minn.; All Package Grocery Co., Woolworth Bldg., New York City; Allen & Lewis, Portland, Oregon; Alexander Brothers, Inc., Philadelphia, Pa.; Alvah Bushnell Co., Philadelphia, Pa.; American Can Company, New York City; American Chemical & Mfg. Co., Norfolk, Va.; American Machinery Syndicate, New York City, N. Y.; American Manufacturing Concern, New York City; American Pressweld Radiator Corporation of Michigan, Detroit, Michigan, J. A. Irwin, General Manager; American Swiss Finish Co., Providence, R. I.; American Valve and Tank Co., Fairmont, West Va.; J. K. Amoury, J. K. Amoury & Son, New York City; Anderson Electric Specialty Co., Chicago; Anderson Manufacturing Co., Des Moines, Iowa; Antiseptic Products Company, Denver, Colo.; Apothecaries Hall Company, Waterbury, Conn.; John T. Ardis, Finance Committee, General Motor Corporation, Wilmington, Del.; Art Urn Company, Brooklyn, N. Y.; Atlantic Utility Works, East Point, Ga.; Atlas Roofing Co., New Burgh, N. Y.; W. Atlee Burpee Co., Philadelphia, Pa.; Austin, Nichols & Co., Brooklyn, N. Y.; C. E. Ayre, Avalon, Calif.; Alpha Portland Cement Co., Easton, Pa.; American Saw Mill Machinery Co., Hackettstown, N. J.; American Trading Co. of Cuba, Havana, Cuba; American Watch Case Co., Inc., New York City; C. L. Bailey Grocery Co., Marietta, Ohio; Baltimore Car Wheel Company, Baltimore, Md., J. Paul Baker, President; Barley Motor Car Company (Manufacturers of the Roamer), Kalamazoo, Michigan, C. E. Stephenson, Secretary; Barnes and Tibbitts Shipbuilding and Dry Dock Company, Alameda, Calif., W. S. Tibbitts, President; Bayer Company, Inc., New York City; Belle Meade Farms, Belle Meade, Va.; Bemis Bros. Bag Co., Houston, Texas; Luigi Berardo, New York City; Blakeslee, D. W., Pennsylvania Electric & Mfg. Co., Irwin, Pa.; Blatchford Calf Meal Co., Waukegan, Illinois; Bonner Mercantile Co., Deer Lodge, Montana; Boston Woven Hose & Rubber Co., Boston, Mass.; Braun Corporation, Los Angeles, Calif.; The Breakers, Atlantic City, New Jersey, Joel Hillman, President; The Bronzo Aluminum Corporation, J. E. Kauffmann, President, Buffalo, N. Y.; Martin Brotherson, Manager, Haffer Supply Company, Jobbers and Distributors, Joplin, Mo.; John W. Brown, President, Cleveland Electric Metals Co., Cleveland, Ohio; Brunswick-Balke-Collender Co., New York City; J. P. Barnes, General Manager, Schenectady Railway Co., New York City; The Bearings Co. of America, Lancaster, Pa.; Best-Clymer Manufacturing Co., St. Louis, Mo.; A. C. Basselman & Co., New York City; California Wholesale Grocery Co., Los Angeles, Calif.; Campbell Holton & Company, Wholesale Grocers, Bloomington, Ill.; Canton Art Metal Co., Canton, O.; Louis B. Caproni, M. Gurney & Sons, Inc., Oneonta, N. Y.;

W. C. Carey, Iroquois Natural Gas Co., Buffalo, N. Y.; Carlton Consolidated Lumber Co.; Carrollton Excelsior and Fuel Co., Ltd., New Orleans, La.; Case, R. E., care The International Nickel Co., New York City; Celite Products Co., N. Y.; Chain-O-Spark Corporation, President, W. G. Calderwood, Minneapolis, Minn.; Champion Chemical Co., Springfield, O.; Channel Commercial Co., Los Angeles, Cal.; Chicago Varnish Company, Chicago, Ill.; Cleveland Electric Metals Co., Cleveland, Ohio; Cleveland Metal Products Co., Cleveland, Ohio, E. A. Dodd, Vice-President; Palmer Clingman, The Sperry Gyroscope Co., Brooklyn, N. Y.; Closset & Devers, Portland, Oregon; Collier Keyworth Co., Gardner, Mass.; Columbus Handle & Tool Co., Columbus, Ind.; Cook Paint & Varnish Co., Kansas City, Mo.; W. Dewey Cooke, Secretary and Sales Manager, Southern Fertilizer & Chemical Co., Savannah, Ga.; Consolidated Lumber Company, Manistique, Michigan, Leo. C. Harmon, Vice-President; The County Agent & Farm Bureau, Chicago, Ill.; Cuba-Americas Mercantile Company, Inc., New York City, thru J. M. Walsh, Vice-President; Curd & Blakemore Company, Louisville, Ky., thru Marcus Blakemore; Chicago Mirror and Art Glass Co., Chicago, Ill.; C. A. Colman Co., New York City; Dairy Cream Separator Company, Lebanon, Indiana, James K. Risk, Treasurer; A. R. Danagh, of Haworth & Dewhurst, Ltd., Wholesale Grocers, Pittsburg, Pa.; Davies, Arjay, Easton, Pa., President of Tombler Grocery Co.; W. B. Davis & Co., Aurora, Ill.; Delta Mercantile Co., El Centro, Calif.; Demen Bros. Company, Grain Dealers, Walla Walla, Washington; Detroit Motor Parts Co., Detroit, Michigan, F. M. Keeton, Vice-President; Detroit Stove Works, East Detroit, Mich.; A. Deutz & Brother, Jobbers and Exporters of Hardware, Laredo, Texas; Dexter Portland Cement Co., New York City; De Zeng Standard Co., Camden, N. J.; Ed. L. Dithridge, Germain Seed & Plant Co., Los Angeles; Henry L. Doherty & Co., Toledo, Ohio; Domestic Mills Paper Co., New York City; D. M. Donnan, President and Manager, Electrical Engineering and Manufacturing Company, Pittsburgh, Pa.; David Dows, President, American Grondal Co., New York City; Drake & Co., Wholesale Grocers, Easton, Pa.; Duluth Shipbuilding Co., Duluth, Minn.; Dunbar-Dukate Co., New Orleans, La.; Dunham Company, C. A., Marshalltown, Iowa, thru A. R. Welker, Mgr. Finance and Accounts; Duquesne Oil & Supply Co., Pittsburg, Pa.; Chas. D. Durkee & Company, 2 and 3 South Street, New York City, thru P. F. Wiese, Secretary; Edward L. Davis Lumber Co., Louisville, Ky.; A. De Prima Co., Inc., New York City; Thomas C. Desmond, President, Newburgh Shipyards, Inc., New York City; Ebrey Chemical Works, Humacao, Puerto Rico; Echeguren & Co., San Francisco, Cal.; Eclipse Valve Grinder Co., Kansas City, Mo.; Ederheimer Stein Co., Chicago, Ill.; Clarence E. Edson, Cleveland, Ohio; Eimer & Amend, New York City, thru A. O. Eimer, Assistant Treasurer; Electric Smelting & Aluminum Company, Sewaren, New Jersey, thru Alfred H. Cowles, President; Electric Supply & Equipment Co., Hartford, Conn., thru H. E. Page, President; W. E. Ellis Co., Haverhill, Mass.; Ernest O. Engstrom, President, Marcy Co., Boston, Mass.; Easton Car and Construction Co., Easton, Pa.; Economy Drawing Table & Manufacturing Co., Adrian, Michigan; Ellis Adding-Typewriter Co., Newark, N. J.; Falcon Packing Co., New York City; Fansteel Products Company, Inc., North Chicago, Ill.; C. W. Ferguson Collar Company, Troy, New York; Ferracute Machine Co., Bridgeton, Pa.; Field Force Pump Co., Elmira, N. Y.; J. Logan Fitts, Warren Webster & Co., Camden, N. J.; Flaketown Graphite Co., Mountain

Creek, Ala.; Fleetwood Metal Body Company, Fleetwood, Pa., thru N. J. Kutz, Purchasing Agent; Foley Fertilizer Company, Foley, Alabama; M. Furuya Company, Seattle, Washington, Importers and Exporters, Japanese and American; J. A. Flemer, Merchant, Westmoreland County, Virginia; Foss Islands Tannery, York, Pa.; Garhart Dental Specialty Co., Malden, Mass.; Edmund Garrigues, Chief Engineer of Russell & Company, Manufacturers of Machinery, Massillon, Ohio; Geier & Bluhm, Troy, New York, thru James Geier, Manager; Gem Paper Box Co., New York City; General Petroleum Corporation, Los Angeles, Cal.; German Press & Plate Co., Cleveland, Ohio; Gibson Mandolin-Guitar Co., Kalamazoo, Mich.; Gifford Engine Co., Lansing, Michigan; Glogan & Co., Chicago, Ill.; S. M. Gloyd, Lumber Dealer, Oklahoma City, Okla.; Goddard Grocery Co., St. Louis, Mo.; Greenbaum Brothers, Inc., Seaford, Del.; S. J. Griffin, Blackman & Griffin Co., Wholesale Grocers, Ogden, Utah; Griswold Motor & Body Co., Detroit, Mich.; Groneweg & Schoentgen, Council Bluffs, Iowa; Groover-Stewart Drug Co., Jacksonville, Fla.; Haas Bros., San Francisco, Calif.; Hagen, Ratcliff & Co., Huntington, W. Va.; M. D. Haire, Wickes Bros., Seattle, Wash.; Hall Brothers Company, Lincoln, Nebraska; Hall, Luhrs & Co., Sacramento, Calif.; W. H. Hammer, Hammer & Co., San Francisco; Charles H. Harding, of Erben Harding & Co., Manufacturer of Textiles, Philadelphia, Pa.; Geo. W. Hartzell, Piqua, Ohio; Haas, Baruch & Co., Los Angeles, Calif.; Henrici Laundry Machinery Company, Boston, Mass., thru F. Henrici, Works Manager; Wilwyn Herbert, Director, Everlastic, Inc., New York City; Ernest M. Hill, Secretary and Treasurer, Ellicott Square Co., Buffalo, N. Y.; Holbrook Mfg. Co., Jersey City, N. J.; Holmes & Herrick Lumber Company, Gulfport, Miss.; E. Clemens Horst Co., San Francisco, Cal.; Hotchkiss, Blue & Co., Chicago, Ill.; J. W. Hudson, Ukiah, Calif.; Huntington Wholesale Grocery Co., Huntington, W. Va.; Hygienic Products Co., Canton, Ohio; Haenichen Bros. Silk Co., Paterson, N. J.; Charles Harding, President, Harding Cream Co., Omaha, Neb.; Clarence Hodson & Co., New York City; Holliston Mills, Norwood, Mass.; Hypotheck Mining and Milling Co., Wallace, Idaho; H. B. Ibson, Gemco Mfg. Co., Milwaukee; Ilg Electric Ventilating Co., Chicago, Ill., New York, Cleveland, Philadelphia, Pittsburg, Boston, Detroit; Illinois Smelting and Refining Co., Chicago, Ill.; Imperial Machine Co., Minneapolis, Minn.; Independent Cork Co., Inc., Brooklyn, N. Y.; Indicating Calipers Company, New York City, thru Chas. H. B. Stepanek, Manager; Industrial Cotton Oil Properties, Houston, Texas, thru W. P. Beaumont, General Manager; Industrial Materials Co., Inc., New York City; Intercontinental Rubber Company, 15 Exchange Place, Jersey City, New Jersey, thru G. H. Carnahan, President; International Chemical Company, Camden, New Jersey; International Exporting & Importing Corporation; International Trade Developer; C. S. Jacob, Chas. W. Jacob & Allison, New York City; Carl P. Johnson, President, Johnson, Read & Co., Chicago, Ill.; J. Ralph Jones, National Mosaic Tile Co., Mobile, Ala.; Judson Freight Forwarding Company, Chicago, Ill.; Judson Grocery Co., Grand Rapids, Mich.; Victor E. Karminski & Co., Inc., New York City; Geo. D. Kirby, Assistant Secretary, United States Beet Seed Co., Idaho Falls, Ida.; Kneipp Malt Food Co., Manitowoc, Wis.; Koenig Medicine Co., Chicago, Ill.; H. W. Koster, The Koster Co., San Francisco; Krebs, A. S., The Krebs Pigment & Chemical Co., Newport, Del.; Dr. Geo. Frederick Kunz, Tiffany's, New York City; The Lagonda Manufacturing Co., Philadelphia, Pa.; Brown Landone,

Bragant Sunnyside, Long Island, N. Y.; R. A. Leet, Secretary, Bowman Drug Co., Oakland, Cal.; H. Lieber & Co., New York; Lockhart Spiral Service Leggings, Inc., Brooklyn, N. Y.; John Lonke, Bellwood Trading Corp., New York City; The Lord Baltimore Press, Baltimore, Maryland; Los Angeles Valve & Fitting Co., Los Angeles; D. B. Loveman Co., Chattanooga, Tenn.; David Lupton's Sons Co., Philadelphia, Pa.; Geo. L. Mackay, Struthers-Wells Co., Warren, Pa.; Chas. A. Magill, Treasurer, Johnston & Larimer Dry Goods Co., Wichita, Kansas; Manufacturers Trading Corporation, Boston, Mass.; Marcy Co., Manufacturing Chemists, Boston, Mass.; Maryland Glass Corporation, Baltimore, Md.; Mason-Perkins Paper Corporation, Bristol, N. H.; Master Rule Manufacturing Company, Inc., New York City, thru C. M. Nicholson, President; Mathews Gravity Carrier Co., Ellwood City, Pa.; Mayor Coating Machines Company, Rochester, N. Y.; G. B. McBreen, President, Mechanical & Electrical Manufacturing Co., Chicago, Illinois; McKeen Motor Car Company, Omaha, Nebraska, thru W. R. McKeen, President; T. H. B. McKnight, Treasurer, Pennsylvania Lines West of Pittsburgh, Pittsburgh, Pa.; Mediterranean Trading Co., New York; Mendleson Corporation, New York City; Menzel & Company, New York City; Merrell Chemical Co., Cincinnati, Ohio; Merrell Drug Co., St. Louis, Mo.; Michigan Drug Company, Detroit, Mich.; Chas. N. Mikels, Indianapolis, Ind.; Milwaukee Bedding Co., Milwaukee, Wis.; Minneapolis Drug Co., Minneapolis, Minn.; Minute Tapioca Company, Orange, Mass.; Moreland Motor Truck Company, Los Angeles, California, thru Watt L. Moreland, General Manager; Mueller-Metzner Co., Realtors, Louisville, Ky.; Myerstown Foundry & Manufacturing Co., Myerstown, Pa.; McCoy-Linn Iron Co., Milesburg, Pa.; McIntire, Magee & Brown Co., Philadelphia, Pa.; F. W. Miller Heating Co., Chicago, Ill.; Mossberg Pressed Steel Corporation, Attleboro, Mass.; Nashua Lumber Co., Nashua, Minn.; National Audiphone Co., New York City; National Grocery Company, Detroit, Mich.; Nebraska Independent Oil Co., Norfolk, Neb.; Neuman & Schwiers Co., New York City; The New England Granite Works, Westerly, R. I.; Carl Norgren, Assistant Manager of Sales, District of Seattle, for the Chicago Pneumatic Tool Company, Chicago, Ill.; Nilson Die & Tool Co., Chicago, Ill.; New Jersey Machine Corporation, Hoboken, N. J.; Obispo Rubber Plantation Co., New York; Robt. R. Odell, Minneapolis, Minn.; Ohio Galvanizing & Machine Co.; Oklahoma Petroleum and Gasoline Company, Tulsa, Oklahoma; Oliver-Finnie Co., Memphis, Tenn.; Oppenheimer Casing Co., Chicago, Ill.; Alfred F. Osborn, Manufacturers' Export Agent, New York City; Oshkosh Excelsior Manufacturing Co., Oshkosh, Wis.; Otto Weiss Milling Co., Wichita, Kansas, thru W. W. Weiss, Secretary; Pacific Coast Shipbuilding Co., San Francisco, Cal.; Pacific Coast Steel Company, San Francisco; E. C. Palmer & Co., Ltd., New Orleans, La.; Ray Palmer, President, New York and Queens Electric Light and Power Co., City of New York, Long Island City; W. F. Parish, Technical Director, Sinclair Refining Company, Chicago, Ill.; Chas. G. Park, American Linen Supply Co., Chicago, Ill.; Parsons Paper Company, Holyoke, Mass.; F. L. Payne, Decorator, Wichita, Kansas; Peerless Biscuit Co., Pittsburgh, Pa.; Peerless Color Co., Bound Brook, N. J.; W. E. Peirce & Co., Milford, N. H.; Pennsylvania Steel & Iron Corporation, Lancaster, Pa.; Peterson Co., Frank B., San Francisco, Calif.; Pittsburgh Electric & Machinery Works, Pittsburgh, Pa.; Plomb Tool Manufacturing Co., Los Angeles, Cal.; Plumbing & Mill Supply Co., Inc., H. J. Veith, President and Manager, New

Orleans, La.; R. W. Poindexter, Jr., Poindexter & Co., Los Angeles; P. J. Pauly, Jr., President, Pauly Jail Building Co., St. Louis, Mo.; Harold I. Perrin, Jeweler and Optometrist, Sargent, Nebraska; M. C. Peters Mill Co., Omaha, Nebraska; Pillsbury Flour Mills Co., Minneapolis, Minn.; Pomeroy Salt Assn. Co., Pomeroy, Ohio; Porter Chemical Co., Hagerstown, Maryland; Portable Machinery Co., Passaic, N. J.; Radium Chemical Co., Pittsburgh, Pa.; William Rahr Sons' Co., Manitowoc, Wis.; Raisin & Zaruba, San Francisco, California; Frank E. Randall, Waltham, Mass.; Raymond Concrete Pile Co., New York City; Reckitts, Ltd., Blue Manufacturers, New Brunswick, New Jersey; Dr. Fritz Reichmann, Measuregraph Co., St. Louis, Mo.; T. B. Rice & Sons Co., Philadelphia, Pa.; Edro Richardson Brass Co., Baltimore, Md.; Richardton Milling Co., Richardton, N. D.; E. T. Richmond & Co., Bradford, Eng.; Fr. Loes Riedel & Co., New York City; Roberts Cone Manufacturing Co., St. Joseph, Mo.; Roessler & Hasslacher Chemical Co., Perth Amboy, N. J.; Rome Universal Export Co., Inc., thru Calvin Martin, President, Rome, N. Y.; Romeo & Co., Inc., New York City; Rosco Trading Co., New York City; L. Rosenstern Dry Goods Co., Tucson, Arizona; Rumford Chemical Works, Providence, R. I.; Safety Fire Extinguisher Co., New York City; St. Louis Button Co., St. Louis, Mo.; Santa Rosa Mercantile Co., Santa Rosa, N. M.; Colonel Wm. Jay Schieffelin, President, Schieffelin & Co., New York City; A. R. Schmidt Electric Co., Milwaukee, Wis.; Chas. Schoolhouse & Son, New York; Sedgwick Machine Works, 150 West 15th Street, New York City, thru J. I. Wakelee, President; A. M. Selikowitz, care Tapper & Selikowitz, Inc., Exporters and Importers, 26 Cortlandt St., N. Y.; Scranton Stove Works, Scranton, Pa.; Seacoast Canning Co., New York City; H. H. Sherwood, President, Sherwood Company, San Francisco; F. A. Shipley Co., Santa Paula, Calif.; Shipman & Welch, General Contractors, Philipsburg, Pa.; Sinclair Refining Co., Chicago, Ill.; Sloan Electric Co., Santa Fe, New Mexico; Southern Ohio Coal Exchange, Columbus, Ohio; Southern Steel Co., San Antonio, Texas; Splitdorf Electrical Company, 98 Warren Street, Newark, N. J., thru H. E. Borger, Engineer; Standard Chemical Manufacturing Co., Omaha; Standard Construction Engineering and Supply Co., Philadelphia, Pa.; Standard Rice Co., Inc., Houston, Texas; Standard Sanitary Mfg. Company, Pittsburgh, Pa., thru Theo. Ahrens, President; Stewart Manufacturing Co., Waterloo, Iowa; Stromberg Electric Company, Chicago, Ill., thru R. E. Cornelison; Struthers-Wells Co., Warren, Pa.; Superior Laboratories, Mfg. Chemists, Grand Rapids, Mich.; Sussman, Wormser & Co., San Francisco, Calif.; Sweet, William L., Rumford Chemical Works, Providence, R. I.; Spreckels Bros. Commercial Co. (dealers in cement, wood, coal, etc.), San Diego, Calif.; C. D. Soule, Customs House Broker, Sumas, Washington; Edward P. Stahel & Co., New York City; W. O. Talcott, of W. O. & M. W. Talcott, Makers of Belt Hooks, Providence, Rhode Island; Taylor-Wharton Co., Easton, Pa.; Temple Candy Co., Temple, Texas; Texas Carnegie Steel Association, thru C. N. Markle, President; Tharinger Macaroni Co., Milwaukee, Wis.; Thompson-Katz Lumber Co., Memphis, Tenn.; J. M. Thorburn & Co., New York; A. J. Todd, A. M. Todd Co., Kalamazoo, Mich.; F. J. Townsend, Painted Post, N. Y.; Turner Tool Manufacturing Co., Birmingham, Eng.; Tuxbury Oil and Refining Corp., Henry C. Tuxbury, President, New York City; Underwood & Underwood, New York City; Union Electric Manufacturing Co., Milwaukee, Wisconsin; United Electric Apparatus Co., Boston, Mass.; United Wholesale Grocery Co., Los Angeles, Calif.; Universal Machine Co.,

Bowling Green, Ohio; United States Smelting Furnace Co., Belleville, Ill.; Van Guilder Construction Co., Rochester, N. Y.; Veeder Manufacturing Co., Hartford, Conn.; Vera Chemical Co., North Milwaukee, Wis.; Voss Alcohol Export Corporation, New York City; J. M. Walsh, Vice-President, Cuba-Americas Mercantile Co., Inc., New York City; Warner Jewelry Case Co., Buffalo, N. Y.; J. Weller Co., Oak Harbor, Ohio; Wellman, Peck & Co., San Francisco, Calif.; Wenger Milling Co., Dayton, Ohio; Fred Wetzel, Importer and Exporter, Dyestuffs, Chemicals and Pharmaceutical Products, 131 E. 23rd St., N. Y.; Western Chemical Manufacturing Co., Denver, Colo.; West Virginia Coal Company, Richmond, Va., thru E. S. Simpson, President; Western Wholesale Drug Co., Los Angeles, Calif.; Wilcox, Ives & Co., Savannah, Ga.; Wildberg Bros., San Francisco, Cal.; John R. Wiley & Company, Wholesale and Retail Druggists, Trenton, New Jersey; A. P. Williams, R. C. Williams & Co., New York City; Samuel H. Williams, The J. B. Williams Co., Glastonbury, Conn.; Winder & Dean, El Paso, Texas; Wood Iron & Steel Co., Philadelphia, Pa.; J. M. Walshe, General Superintendent, American Scrubbing Equipment Co., Hannibal, Mo.; World Trade Co., New York City; E. J. Yetter, President, Western Elaterite Roofing Co., Denver, Colorado; Youroveta Home & Foreign Trade Co., Inc., New York City.

ENGINEERS, ARCHITECTS AND ACCOUNTANTS

John A. Brashear, President, American Society of Mechanical Engineers, 1914-15; manufacturer of astronomical and physical instruments; Pittsburgh, Pennsylvania (30 May, 1919): "I have been fighting for the Metric System for 40 years, and intend to do so until I have no further use for weights and measures."

Vladimir Karapetoff, consulting engineer; Professor of Electrical Engineering, Cornell University, Ithaca, New York: "I wish all success to the valiant fight in the interest of the metric system."

J. W. Noakler, C. E. and M. E., East Worcester, New York: "As a graduate of the Academy of Science of France I was trained in the metric system and have always used it."

Charles H. Hughes, engineer; Author of Hughes' Handbook of Ship Calculations, Construction and Operation (29 April, 1919): "I agree with the World Trade Club in regard to the metric system."

Joseph E. Camatte, mechanical, electrical and consulting engineer; Tulane University, Atlalta, Louisiana: "It is a great pleasure for me to endorse such a move; as a technical man, of course, I am in favor of metric standardization."

J. Y. Hartman, electrical engineer, American Sugar Refining Company, New Orleans, La.: "The metric system idea has my hearty endorsement—there has never been, to my mind, a reasonable argument against it."

Robert H. Engle, Metallurgical Engineer, Clarksburg, West Virginia; Engle Metal-Distillation Furnace: "I have for many years

been a very strong advocate of the decimal and sincerely hope that I will live long enough to see it become entirely universal."

F. C. Heylman, Mechanical Engineer; Martinez, California: "I am extremely gratified at the movement to convert this country to the use of metric units, the advantages of which have been so universally recognized as to be taken for granted."

A. Christianson, Chief Engineer, Standard Steel Car Company (25 November, 1921): "I am very much in favor of the adoption of the metric system. The Standard Steel Car Company are getting considerable amount of export business, and it all (or a greater part of it) has to be done in the metric system."

A. E. Kennelly, Electrical Engineer; American Exchange Engineering Professor in France, 1922: "Large amounts of time and effort are wasted perennially in North America, on the cumbersome units of weights and measures in the customary English system. There are some 45 units of measure in the tables of that system; and there are certain serious ambiguities in the meanings of those units. A scientific paper written in non-metric units is not a world paper, but a sectional paper." (In *"Research in Engineering Colleges,"* University of Toronto Press, 1921. See also numerous other citations from this authority; consult Index.)

P. G. Zwilgmeyer, Engineer; Northern Pacific Headquarters, Tacoma, Washington: "If there is any one subject that is of greater practical importance to the professional Engineer than that of exact measurement, I am free to confess that I have never met with it. The metric system of weights and measures has the same advantage over the older systems as has the so-called Arabic (or rather Hindoo) notation, or decimal system, over those of classical antiquity. Adoption of the metric system is one of the steps that will have to be taken before our great country can fulfill its destiny and become a leader among nations." (From address delivered before the **Tacoma Chapter, American Association of Engineers,** 5 March, 1920. This organization at that time passed strong resolutions calling upon the United States Congress to establish gradual metric standardization.)

W. A. Silliman, Altoona, Pa. (5 March, 1920): "If it were left to the mining and civil engineers, we would very quickly be on a decimal system, the only hindrance to the metric units being the fact that so many old records are on the former units. That this latter is a matter of small consequence is shown by the fact that mining and civil engineers consider it no hardship to have to translate rods, perches, yards and inches into feet and decimals of a

foot. I hope to see the time when we can dispense with inches altogether."

F. L. Olmstead, Landscape Architect, Brookline, Mass. (5 March, 1920): "I am convinced of the desirability of bringing about the general use of the metric system in the United States."

J. Ashton, Engineer, Pittsburgh, Pa. (29 March, 1920): "In my opinion, the metric system of weights and measures should greatly reduce mistakes, misunderstandings and miscalculations."

Charles W. Lang, Consulting Engineer, New York City (6 March, 1920): "The worthy effort to cause universal use of the meter-liter-gram standards of quantity is indeed commendable. The writer has long been converted to this modern sensible system and will gladly use all reasonable diligence to assist the noble cause."

Comfort A. Adams, consulting Electrical Engineer and Dean of Harvard University Engineering School; in article on Engineering and Industrial Standardization, in the "Journal of Electricity," November, 1919: "Nearly all European nations as well as the Latin-American nations have adopted the rational metric system, whereas the English speaking nations still cling to the English system with its confusion of oddly related weights and measures. However, since the electrical and magnetic units are the same the world over, since they are based upon the metric system, and since practically all scientific work is handled by that system, a vast amount of time is wasted by the English speaking nations, not only by the necessity of becoming familiar with both systems, but also in their use due to the frequent necessity of transformations from one to the other. This latter loss is particularly serious in the field of electrical engineering."

Thomas Corwin Mendenhall, of the U. S. Geodetic Survey; before the Engineers' Societies said of meter-liter-gram: "These units are bound to come into universal use in the near future. The prodigious advantages attainable thru their simplicity, economy and uniformity assure their world-wide use."

Hobart B. Upjohn, M. E. A. J. A., Architect, New York City (27 May, 1919): "I wish to place myself on record as being heartily in favor of the adoption of the Metric System in this country. Anything that I can do to assist in its adoption I shall be very glad to do. I consider our present system as highly expensive. As an architect I receive surveys laid out to scale of 10ths of an inch. It is necessary to transform these surveys to our own scales, thereby running a risk of error. I believe the number of errors made thru just the misunderstanding of the one item 1'-0" and 10" has cost the general public annually in this country untold amounts of

money. I believe the adoption of the metric system by the engineers, architects and manufacturers would eliminate numberless errors, which only those in practice realize and of which nobody knows accurately the actual cost."

Edward C. Newcomb, Consulting Engineer for the Wright-Martin Aircraft Corporation, New Brunswick, New Jersey (11 June, 1919): "Before the international standardization of automotive parts or of any line of material can be successfully carried out, the standard of measurement used must be the same in all countries, hence I endorse legislation that will bring about the exclusive use of meter-liter-gram by the United States of America."

F. J. Walsh, Consulting Engineer of the Port of Tacoma, Washington (9 July, 1919): "I am glad to do my 'bit' towards the furtherance of this great international movement, which I believe will not only promote industrial harmony and economy, but will advance the cause of a permanent, world-wide peace. Incidentally, I may say I am glad to see that San Francisco is in the forefront in this, as in many other movements for the benefit of humanity and the promotion of commerce."

Charles W. Dawson, Architect; member of American Institute of Architects; Society of Technology; British Fire Prevention Committee; National Fire Protection Association; Muskogee, Okla. (10 June, 1919): "I am most heartily in favor of the adoption of the metric system in this country. In my profession we have to use that system in connection with many phases of our work, but we are still burdened by the unrelated, cumbersome and obsolete systems of measurement which still obtain in the calculation of land, of stone, of products sold by the pound, and all things reckoned by feet and inches. It seems ridiculous that we should burden ourselves in this way; should continue to teach our children such ancient methods, and should go on handicapping our nation, not only in its everyday life, but in its dealings with the rest of the world. I cannot too strongly urge that you favor the adoption of the meter-liter-gram as the official system of measurement in the United States of America."

Joseph F. Merrill, Director, Schools of Mines and Engineering, University of Utah; before the Standardization Conference, American Mining Congress, Denver, Colorado: "The system of weights and measures in current use in the United States is cumbersome, complicated and unscientific. It is a medley, a jumble. Its use impedes progress, **wastes hundreds of millions of dollars** annually, and hampers the commerce of the country, especially the world commerce.

"Why not now adopt the metric system in the United States? Some few fear that this would mean a loss to them. But under gradual metric standardization no part of any manufacturing plant shall be scrapt, until completely worn out. Every existing size may continue indefinitely to be used, but after a definite date, sizes will be described in metric language units, everywhere used, everywhere understood.

"Simplicity results in economy; the adoption of the simple metric system by the United States will result in **an enormous annual saving** of time, which expressed in terms of money will run into many hundreds of millions of dollars. Furthermore, the use of the metric system by us will extend our friendly trade relations and be a powerful means of promoting world progress and peace."

Fred J. Miller, former President, **American Society of Mechanical Engineers** (1920); member, Herbert Hoover's Committee on the Elimination of Waste in Industry, American Engineering Council; former Editor, *"American Machinist"*: "Manufacturers opposing the adoption of metric weights and measures in the United States of America are subject to an illusion. This opposition arises from a concentrated and long continued effort to convince them that the adoption of the Metric System would mean a great pecuniary loss for them. This has resulted in the organization of an association, the sole object of which is to maintain this illusion. Such an erroneous impression should be corrected."

Ernst & Ernst, Audits and Systems (19 branch offices), thru F. H. Figsley, New York City: "We are eager and ready to give our unqualified support to any movement that will further the ends of the metric standardization work which the World Trade Club has undertaken."

Rosenberry, Gunther & Breyer, Business Engineers, Cleveland, Ohio: "We shall do all we can to further the meter-liter-gram project."

P. H. Hessol, Cost Accountant for the American Druggists Syndicate, New York (27 May, 1919): "I want to go on record as being heartily in favor of adopting the exclusive use of the meter-liter-gram, or the metric system, in place of the system presently in use in this country. I sincerely believe that it will be of inestimable value to every business and I know it would help us greatly in ours. In cost accounting work we have a voluminous number of intricate calculations which are frequently made difficult, and unnecessarily so, by reason of the use of our present system. I cannot understand how anybody doing any kind of figuring can be opposed to this movement."

Roger W. Babson, President, Babson Statistical Organization, Boston, Mass. (16 March, 1921): "I am convinced that the gradual adoption of the metric system of weights and measures is best for the United States of America. We live in a scientific age where we do things better than formerly. The world is moving on, and we must not stand still in so vital a field as measurement, for measurement is the master art which leads all arts and crafts, all industry and commerce, all finance and statistics, and now in all legislation.

"The United States of America must take its place with the other nations of the world which have already abandoned their old system of weights and measures as the legal standard, and set up a new international decimal system of weights and measures of the highest scientific and practical efficiency."

C. E. Ayre, Avalon, California (16 August, 1919): "Many thanks for your folder and blanks relative to the movement for sinking and dynamiting the thumb and elbow and tin-pot method of measuring and weighing. I am a member of The American Appraisal Co., and this question of meter-liter-gram is one that touches us very closely. We have a staff of something like 400 people juggling with this mess of figures 8 hours a day."—(Letter to World Trade Club.)

Among the other Engineers, quoted elsewhere in this book, who urge gradual metric standardization are John Hays Hammond, Comfort A. Adams, Arthur E. Kennelly, Thomas Edison, Hudson Maxim, Theodore H. Miller, Howard Richards, Frank G. Bolles, David Molitor, R. C. Bailey, Alexander Graham Bell, S. J. Macfarren, Arthur Bessey Smith, F. W. Andrew, Burgess Darrow, Clancey M. Lewis, O. L. Lewis, Colonel Thos. H. Rees, and many others; especially, many quoted in the "Manufacturers" List. (Consult Index.)

Included in the thousands of Engineers, Architects and Accountants working for the metric units are the following: Charles P. Steinmetz, Consulting Engineer, General Electric Company, Schenectady, New York; Charles Paget of Purnell & Paget, Architects, Civil and Mining Engineers, Canton, China; Charles W. Merrill, Metallurgist, San Francisco, Cal.; R. H. Halpenny, Electrical Engineer, Southern Sierras Power Company, Riverside, Cal.; G. W. Gail, Jr., Mechanical Engineer, Clover Hill Road, Baltimore, Maryland; Serval Herbert, Business Engineer, Engineering Service Corporation, Asheville, N. C.; George M. Keenan, Efficiency Engineer, Lehigh Valley Transit Company, Allentown, Pa.; T. Kennard Thomson, Civil Engineer, New York City; W. H. Staver, Mining Engineer, New York City; Robert Sibley, eminent Mechanical and Electrical Engineer, Editor-in-Chief "Journal of Electricity and Western Industry," San Francisco, California; M. Duncan, of Duncan, Young & Company, Consulting Engineers, New York City; Paul D. Sargent, Chief Engineer, State Highway Commission, Augusta, Maine; W. W. Stevenson, Power Plant Efficiency Engineer, Pittsburgh, Pa.; H. W. Turner, Mining Engineer, Mills Building, San Francisco, Cal.; M. M. Wills, Mechanical Engineer, Fitchburg, Mass.; Philander Betts,

Chief Engineer, Board of Public Utility Commissioners of New Jersey, Newark, N. J.; R. N. Coffman, Electrical Engineer and Designer, Newark, Ohio; James Coyne, Engineer, Boston, Mass.; E. E. F. Creighton, Engineer, Schenectady, New York; Charles J. Costigan, County Engineer, County of Summit, Akron, Ohio; O. R. Delamater, of the Chadick, Delamater Corporation, New York City; H. Deverell, President, Deverell, Spencer & Company, Contracting Engineers, Baltimore, Maryland; A. F. Fischer, C. E., Johnson County Engineer, Iowa City, Iowa; A. J. Eddy, Department of Civil Engineering, University of California, Berkeley; C. Poole, Chief Engineer, Southern Sierras Power Company, Riverside, California; Paul M. Downing, Pacific Gas & Electric Company, San Francisco, California; Frank H. Drury, 10 South LaSalle Street, Chicago, Illinois; Angus S. Hibberd, Consulting Engineer, Bell Telephone Building, Chicago, Illinois; Gordon Strong, Chicago; S. H. Woodbridge, Engineer, Langford House, Cape Porpoise, Maine; C. A. Norman, Professor of Machine Design, Ohio State University, Columbus, Ohio; J. C. Stevens, Consulting Engineer, Spalding Building, Portland, Oregon; W. A. Silliman, Mining Engineer, Altoona, Pennsylvania; F. L. Bishop, Dean, School of Engineering, University of Pittsburgh, Pittsburgh, Pa.; J. C. Nagle, Dean, Department of Engineering, Agricultural and Mechanical College of Texas, College Station, Texas; Martin Penhallick, Engineer and Farmer, Neppel, Washington; C. E. Grunsky, San Francisco, Cal., and thousands of others.

SCIENTISTS AND INVENTORS

It is well known that Scientists and Inventors are unanimous in favor of the metric system. Under the strange reasoning of obstructionists, the fact that these experts who employ metric units in their practical work are outspoken in their advocacy of the metric advance is used as an argument against the metric system. It is in truth the most eloquent testimony as to the convenience and utility of the metric units that those who have actually worked with them are enthusiastic urgers of their wider use thruout education, commerce and industry. Industry in its modern sense is based almost entirely upon the discoveries and researches of these Scientists and Inventors, and Industry now should heed their urgings that it gradually place itself upon the world metric basis to gain utmost efficiency.

In the Chapter on "Organized Effort" are listed hundreds of Scientific associations which are active in advocacy of the metric advance. The leading part of the American Association for the Advancement of Science is pointed out; and likewise the progressive attitude of the National Institute of Inventors and similar organizations. Elsewhere in this volume are cited the favorable statements of such Scientists and Inventors as Alexander Graham Bell, Luther Burbank, Thomas A. Edison, John Hays Hammond, Hudson Maxim, A. E. Kennelly, H. V. Arny, and other eminent

men. (Consult the Index.) It may be put down as a verity that all scientists favor the metric system; so that but a few statements need be instanced here to show their unanimity:

Alexander McAdie, Director, Blue Hill Observatory, Readville, Massachusetts (Harvard University): "Blue Hill Observatory uses the metric system, and winds have been for 15 years recorded in meters per second and not miles per hour. . . . The United States of America cannot differ as to the advisability of joining hands with 35 other nations of the world in the adoption of sensible and scientific units of measure." (Professor McAdie uses metric units exclusively in his book, "Principles of Aerography." He was for 18 years in charge of the U. S. Weather Bureau, San Francisco.)

Herbert T. Wade, Editor of "Physics and Applied Science," Editor of the "New International Encyclopedia," and a world industrial authority of note, writes in the "Scientific American": In modern manufacturing, cost analysis and accounting has become as general as it is necessary, and this involves considerable clerical work and calculation. Even today the metric system could be introduced into much industrial work with small expense in the way of providing suitable weights, measures, scales and weighing machines; and in the control of processes the data at any stage would be secured and handled with much less effort and clerical labor. The experiment should be well worth the effort. Indeed to many engineers who have given thought to the matter the practical efficiency of the use of international metric weights and measures is a single argument sufficient to warrant its adoption."

E. P. Lewis, Professor of Physics, University of California (19 September, 1921): "I do not think that we can hold out against the practical advantages of the metric system and its stimulating influence on commercial relations. Some day the world will certainly adopt an international system, and it is safe to bet that it will not be the 'English.' When the change comes it will be brought about by economic pressure, not by argument."

Francis Lowell Burnett, Eminent Pathologist, Boston, Massachusetts: "In my laboratory I have adopted the metric system entirely; and for long have felt the need for the universal system of weights and measures."

Garrett P. Serviss, eminent astronomer and writer: "The metric system of weights and measures is far preferable to the English." (In New York "Evening Journal," 15 July, 1921.)

Paul Drolshagen, scientist and author, Tampa, Florida: "This last war was a lesson to us. I have seen our engineers in their frantic efforts to transcribe into metric units the old-fashioned

weights and measures now in use, and, while I am not a statistician, I can safely assert that adoption of the metric system 10 years ago would have meant a saving of millions of dollars to our country during the war."

G. R. Brigham, Smithsonian Institution, Washington, D. C. (10 May, 1919): "I am very glad to give the meter-liter-gram system my endorsement unofficially, because our papers circulate so widely abroad. A standard system would obviate much extra work on our part."

R. R. Snowden, Agricultural Chemist, Los Angeles, California (12 May, 1919): "I wish to endorse unconditionally the exclusive use of the metric system of weights, measures and coinage as a world necessity, to say nothing of its supreme simplicity and usefulness as a local practice."

E. E. Schneider, Wood Expert, Bureau of Forestry, Manila, Philippine Islands (26 December, 1919): "I have been a strong advocate of the adoption of the metric system for years."

F. E. Stewart, Director of Scientific Department of H. K. Mulford Co., Philadelphia (9 December, 1919): "We are working under a handicap in this country in relation to our trade with those nations of the world where the metric system is in vogue; and it would certainly be a great advantage to all concerned if we could have a universal standard for weights and measures."

Thousands of other scientists have publicly urged exclusive adoption of the metric units by the United States of America. A number of these may be cited as typical:

William James Beal, noted botanist, Amherst, Massachusetts; C. E. Bogardus, of the Bogardus Testing Laboratories, with offices in many American cities; R. S. Ellis, Director, Water Purification Laboratories, Chicago, Illinois; Russell C. Erb, of the Russell C. Erb Laboratory, Bethlehem, Pennsylvania; James Howard Gore, mathematician, scientist, astronomer, geographer, George Washington University, Washington, D. C.; W. M. Grosvenor, consulting chemist, New York City; K. H. Knudson, official chemist for the Norwegian-American Chamber of Commerce; John M. McCandless, of the McCandless Laboratories, recently State Chemist of Georgia; F. F. Millspaugh, Curator, Department of Botany, Field Museum of Natural History, Chicago, Illinois; E. W. Nelson, Chief, Bureau of Biological Survey, U. S. Department of Agriculture; R. L. Nougaret, Viticulturist in Charge, State Department of Agriculture, Sacramento, California; G. R. Wieland, eminent Paleontologist, New Haven, Connecticut; William Trelease, Botanist, Urbana, Illinois; David Fairchild, eminent botanist, of U. S. Department of Agriculture, Washington, D. C., and innumerable others.

PHYSICIANS, SURGEONS AND PHARMACISTS

In the Chapter on "Organized Effort," evidence has been given of the wholehearted support of metric standardization by physicians, surgeons and pharmacists. Not only have their national and local associations worked to extend the use of the metric units, but individually they have expressed themselves decisively. Such men as General Gorgas, Dr. Harvey W. Wiley, William J. Schieffelin, S. L. Hilton, Dr. Henry Smith Williams, E. L. Fisk (Medical Director of the Life Extension Institute), and others eminent in these fields are quoted elsewhere in this volume. (Consult Index.) Opinion in favor of gradual metric standardization is virtually unanimous among Physicians, Surgeons and Pharmacists, but a number of typical statements will clearly indicate this unified position:

Dr. Charles H. Mayo, of the famous team of Mayo Brothers, physicians, Rochester, Minnesota (who gave $2,000,000 for the good of humankind): "The metric system is now used generally by the medical profession and should be standardized for universal use."

Dr. Francis E. Fronczak, Health Commissioner, City of Buffalo, New York: "I am strongly in favor of any measure that will bring about the universal use of metric units."

Dr. C. L. Olsen, Member of State Board of Medical Examiners, Salt Lake City, Utah: "Words cannot express the manifest incongruity exhibited by the use of the present chaotic system (?) of measurement in the United States and Britain."

Dr. C. B. Pinkham, Secretary-Treasurer, Board of Medical Examiners, State of California: "I heartily endorse legislation that will bring about the exclusive use of meter-liter-gram by the United States of America."

Dr. R. H. Needham, Arlington Heights Sanitarium, Fort Worth, Texas: "I fully realize the usefulness and simplicity of the metric system. I wish that all other weights and measures were at the bottom of the sea."

Arthur G. Hulett, Secretary, Arizona State Board of Pharmacy, Phoenix, Arizona (22 April, 1919): "I have always endorsed the metric system and trust it will now be established."

Dr. Ralcy Husted Bell, New York City: "The stupid inertia that withholds the universal adoption of the metric system is almost incomprehensible."

Dr. A. J. Casselman, Department of Health, State of New Jersey (18 December, 1919): "This Bureau wishes to co-operate in standardizing weights and measures. This office does not use any other form of measurement than the metric."

Dr. Omar T. Cruikshank, Pittsburgh, Pa.: "I have used the metric system for almost 30 years as far as possible in my work, and always wondered why it was not used exclusively for everything, especially when it is necessary to convert it into the various barbarous systems in use here."

Orel Jones, President, Nebraska Pharmaceutical Association, Oconto, Nebraska (10 April, 1920): "We at the present time in this part of the United States of America still use the peck and bushel for the measuring of grain and farm products, but you do not have to go very far West from here until you see them using the 100-weight entirely. If it is so much more convenient for them to use the 100-weight when the other weights are official, why would it not be still more convenient to have all weights go by 10s as our coinage does?"

Among the other Physicians, Surgeons and Pharmacists whose opinions in favor of meter-liter-gram might be quoted are: Dr. Emile Altman, New York City; Dr. E. Garnsey Brownell, 132 East 60th Street, New York City; Dr. William Buchanan, Commissioner of Health, Hammond, Indiana; Andres Catanjal, District Health Officer, Iloilo, P. I.; Dr. Andreas F. Christian, The Stoughton Sanitarium, Stoughton, Massachuestts; Walter E. Conley, acting General Medical Superintendent, Metropolitan Hospital, Blackwell's Island, New York City; Guy L. Edie, Colonel, Medical Corps, San Francisco, Cal.; Dr. A. Frackelton, Dentist, Milwaukee, Wisconsin; LeGrand Haskin, Optometrist, St. Petersburg, Florida; N. Hayes, Surgeon, Nebraska Soldiers' and Sailors' Hospital, Burkett, Nebraska; Dr. J. N. Hurty, Secretary, State Board of Health, Indianapolis, Indiana; Dr. William Keith, physician in charge, Tjisaroea Mission Hospital, Buitenzorg, Java; Dr. J. E. Klotz, Westboro, Massachusetts; Dr. J. H. Kolter, Dentist, Wausau, Wisconsin; H. H. Laughlin, Superintendent of Eugenics Record Office, Carnegie Institute of Washington; Frank Brewer Marchant, Eyesight Specialist, Brooklyn, New York; Dr. Adolph Meyer, Johns Hopkins Hospital, Baltimore; Edwin R. Morris, D. D. S., Patterson, N. J.; Dr. John W. Mowell, State Medical Board, Olympia, Washington; Dr. H. N. Nelson, President, Utah State Dental Society; Dr. R. M. Pearce, General Director, Division of Medical Education, Rockefeller Foundation; Dr. George B. Peck, former Honorary President of the American Institute of Homeopathy, Robinson Hospital, Berea, Kentucky; Dr. R. W. Shufeldt, noted Medical Author and Physician, Washington, D. C.; W. R. Tipton, M. D., Superintendent of State Hospital, East Las Vegas, New Mexico; Dr. A. B. Wadsworth, Director, Department of Health, State of New York; Major Joseph H. Way, President, State Board of Health, North Carolina; Dr. R. W. Wilcox, noted Medical Author, New York City; Weber Clinic, Davenport, Ohio; Wood Vaccine Institute, Chicago, Illinois, and thousands more.

On file with the Department of Commerce, Washington, D. C., are 11,000 petitions from Physicians and Surgeons urging the passage of Metric Standards legislation.

AGRICULTURE AND FORESTRY

That Metric Standardization would bring great benefit to Agriculture thruout the United States of America is acknowledged by all who have thoroly investigated the present unstandardized, chaotic condition of weights and measures in our rural districts. Senator E. F. Ladd of North Dakota, who for 30 years has labored to promote the best interests of the agricultural communities, as well as the best interests of all the people, is the leader of the metric forces in the United States Senate. He introduced the Ladd Metric Standards Bill with the aim of facilitating the merchandising of American commodities, including agricultural products, thruout the world. Senator Ladd was the organizer of the great Agricultural Conference in Washington, D. C., January, 1922; and is a prominent member of the Agricultural group of the United States Senate. This group of 22 Senators is committed by its program to support world metric standardization of weights and measures.

As one close student of world agricultural conditions has said: "It will greatly aid the American farmer when his products are quoted in billions of copies of newspapers, journals, and magazines thru all the whole world in the world language of quantity—meter-liter-gram—so that all will understand; world pound, world ton, world quart, world yard. In the world measures of quantity, understood by the whole human family, the farmer can see and understand whether or not the farmer gets his just share under the quotations and prices being paid for farm products. The juggery-pokery of antique measures of quantity should be forthwith scrapt. Let the farmer see!"

The large majority of agricultural experts and workers who have given consideration to this matter urge the metric standards. Thousands of statements could be cited, and from among these a number will be here given to present the overwhelming consensus of opinion favorable to the metric advance:

J. R. Howard, President, American Farm Bureau Federation (2 February, 1922): "I would personally be very glad to see the Metric System induced in the United States and will give the measure encouragement."

Samuel Adams, Editor, "American Fruit Grower," Chicago, Illinois (31 January, 1922): "It is my personal belief that the idea of bringing the world over to a new (metric) standard is advisable, and I will be very glad to co-operate to secure such a result."

E. T. Meredith, when Secretary of the United States Department of Agriculture, Washington, D. C. (16 June, 1920): "I have noted with interest the arguments in favor of the international

metric system. In the scientific services of the government as well as in the scientific institutions of this country, the metric system has long been established. For this reason, and because it is felt that science and industry would be brought into even more intimate relations by the adoption of the metric system, the officials of the scientific bureaus of the Department are of the opinion that advantages would result from the general adoption of the metric system as the standard of weights and measures of the country."

Henry C. Wallace, United States Secretary of Agriculture, Washington, D. C. (18 July, 1921): "The adoption of the metric system should result in preventing a vast amount of confusion and unnecessary labor that is inevitable with the system now used. However, the change from the present system to the metric system would very profoundly affect many industries and for that reason no steps looking toward a change should be made without first giving very careful consideration to the methods of change which would bring the least amount of hardship upon those concerned."

Arthur Sampson, National Secretary-Treasurer, American Society of Equity ("an organization that teaches Co-operation among farmers"): "We are in favor of the Metric System. The adoption of the Metric System by the United States of America would greatly facilitate and reduce labor of computation. I believe it would be to the advantage of both instruction and practice."

J. C. Mohler, Secretary, Kansas State Board of Agriculture, Topeka, Kansas (3 May, 1920): "I am heartily in favor of the adoption by the United States of the metric system of weights and measures."

Frank Spurrier, farm advisor, Stockton, San Joaquin County, California: "I feel very strongly on this matter of our backward systems of weights and measures and will do all I can in furthering the adoption of the metric system."

C. P. Dadant, Editor, "American Bee Journal," Hamilton, Illinois: "The metric system is learned in a few hours by the least competent child. The English weights and measures are rarely learned fully in a whole life of practice. It is high time for the world to drop those irregular and intricate methods which require several unnecessary operations to achieve what is readily done in one operation by the decimal metric system."

"Orchard and Farm," Los Angeles, California (August, 1919): "There is really no excuse, in fact, other than that of established

precedent, for continuing to use the antiquated system with which we are all familiar. And in this progressive age, precedent should furnish no serious obstacle to the adoption of improved standards. From Washington down, our best statesmen and economists have advocated the metric system; but it has been casting pearls before Congressmen only able or willing to think in terms of gallons of molasses, bushels of corn and pounds of fat pork. They, and all of us, may as well accept the system, because the exigencies of trade shortly must force it upon the country."

F. A. Shipley Company, Santa Paula, California; wholesale California walnuts and other products: "We are certainly with you on this metric advance, and will take steps to further the cause." (The California Almond Company also urges the Meter-Liter-Gram.)

"Dairy Farmer," Waterloo, Iowa (largest circulation of any Dairy paper in the world), thru Kirk Fox, Associate Editor (20 January, 1922): "We are in favor of the Metric Standards Bill and hope to see it pass. While there are possible objections to the change of standard, we are convinced that they will be overcome as the old is gradually replaced by the new."

J. G. Lipman, Director, Agricultural Experiment Station, State of New Jersey, New Brunswick, N. J. (5 May, 1920): "I am heartily in accord with those who would establish meter-liter-gram as the standard of measurement."

H. A. Lyon, Director, Bureau of Markets, Department of Agriculture, State of Idaho; also State Sealer of Weights and Measures (3 February, 1921): "Personally, the writer is of the opinion that the metric system is much more efficient than our present standards."

Adn. Hernandez, Director of Agriculture, Government of the Philippine Islands (8 July, 1920): "I heartily endorse the campaign for the standardizing of weights and measures on a decimal basis. The Meter-Liter-Gram system is in use in the Philippines and is highly satisfactory."

"National Nurseryman," Hatboro, Pennsylvania (September, 1919): "The average child of 10 who knows the metric decimal dollar and its subdivision, can learn in 10 minutes as much of the metric system as 90 per cent of all the people ever have occasion to use. The nurseryman has, to a great extent, adopted the metric system in his catalog, quoting price by the 10 and 100 instead of dozen and gross, and will realize to a certain extent the tremendous

saving in effort that could be applied in more profitable effort in other lines. It is a subject that deserves the interest of every citizen, and when opportunity occurs, they should urge the legislators to adopt the meter, liter and gram."

Atlee Burpee, of W. Atlee Burpee & Co., one of the largest seed firms of the United States of America: "The Metric System would insure the Farmer a fair measure. In our business we deal directly with the farmer and study his needs and wishes. I wish every farmer in the United States could have it brought home to him that the adoption of the metric system would save him not only endless confusion and vexation, but would also prevent his purchasing what he thinks is one thing, but which very often turns out to be something entirely different. The widely different State laws as to what constitutes a legal bushel of seed make it possible for the unscrupulous dealer to take advantage of the purchasers.

"As an example, take onion sets. We sell what we call a 'heaping bushel' of from 38 to 40 pounds, whereas the farmer ordering his onion sets from the West or South will receive as low as 23 pounds to the bushel for his money. There is such an utter confusion owing to the different legal standards in different States for the same thing that the farmer in buying his seed from various places has hard work to form any idea of what he is going to get. We have tried to remedy the matter in our own catalog by quoting prices in pounds. If the metric system were introduced, however, the farmer could be sure of getting the same quantity wherever he ordered, for the standard would be the same thruout the United States (and the world.) We sell 23 kinds of grass and grain seed and the weight varies from 7 to 32 pounds per bushel. You can see how confusing the matter is.

"We are earnest advocates of the metric system. The fact that a ½ kilo (500 grams) so nearly approximates a pound will make it an easy matter for the farmer to get a relative idea of the comparative weights of the old and new systems.

"We have found the farmer of today ready to adopt any new method that will help him in his work and we feel sure that once he sees the advantage of the metric system he will throw his influence toward the adoption of 'one weight, one system' thruout the United States."

H. A. Bereman, Editor, "Farmer and Breeder," Sioux City, Iowa: "I have been preaching standardization of weights and measures for 20 years, and have written editorials against our clumsy bushels, tons and quarts, where weights should be used. Now I

am ready to indorse the final standardization of weights and measures in this country by the universal adoption of the metric system."

J. A. Schmidt, Secretary of the Richardton Milling Co., Richardton, North Dakota (23 October, 1919): "We favor the change to the metric system very much. Had occasion to talk this over with quite a few farmers in this territory, who raise such grains as wheat, rye, barley, corn (maize), flax, oats and vegetables of all kinds and they all felt that it would be a better way of trading than the present system. As one expressed himself, it is easier to figure and helps those that are not rapid at figures to figure over their sales and see if they have received the correct amounts due them.

"We consider the cost nothing in comparison with the benefits received by this change for even domestic or local business such as we have here. We handle all the above grains mentioned, buying them and selling them, and the prices change almost daily, so we have a long system of figuring receipts and sales every day into bushels and odd pounds in order to know just where we are at, so as to keep the goods properly 'hedged' in the markets, or sold ahead, thus avoiding any loss in form of speculation. If the items would all show in (world) pounds, by pointing off 2 figures, we would have it in 100-weights—which would evidently be the sale measure in large lots, and by only glancing at the books we could tell where we are at. We heartily recommend the adoption of the meter-liter-gram."

William B. Greeley, Chief of the United States Forestry Bureau, and head of the U. S. Forestry Service in France during the World War: "American lumber jacks and foresters who served in France during the World War were forced to use the world metric system in measuring timber, logs, piling, and lumber. They found the metric system, which was used in all the French timber operations, exceedingly simple and easy to handle."

Emanuel Fritz, Division of Forestry, College of Agriculture, University of California (7 February, 1921): "I shall do what I can to advance the adoption of the metric standards. I was particularly impressed with the metric system during my stay with the A.E.F. in France."

"Successful Farming," thru Alson Secor, Editor (11 February, 1922): "We are not agreed among the States as to the standard bushel. Custom uses the long ton and short ton for various things; the land mile and the nautical mile; the hamper for one class of

products and the basket for another. Cases, crates, baskets, and packages are as numerous as different lines of marketing care to adopt. Perhaps the metric system would not do away with all these, yet when we reform our standards we may as well endeavor to eliminate sectional, product and personal standards of measure. It would seem as if it would be impossible for adults to learn a new metric system, but when we remember that the boys of the A. E. F. soon talked in terms of kilometers instead of miles, we take courage and advocate the change. If done gradually we will make the change without much effort.

"A standard, universal system of measures would be more desirable, even, than a universal language. It would be more difficult for the children in the schools to learn two systems for a period of time, but in the near future education would be relieved of the multiple systems we now use. It would be confusing to all who used old statistics. They would have to interpret all past figures into the new standard, but someone would probably make a business of that for us. Bankers must study the fluctuating values of money when they deal with foreign countries. They soon get so they can think in terms of foreign exchange. So do exporters become familiar with not only foreign exchange but foreign measures. It is not an impossible task, therefore, to learn another system which ultimately will become the one system for the world. **No foreign system can be more confusing than our own conglomerate method of measuring.**" ("Successful Farming," published at Des Moines, Iowa, by E. T. Meredith, former United States Secretary of Agriculture, has a circulation of over 800,000.)

Joint Commission of Agricultural Inquiry, in Report to Congress of the United States of America, 1922: Standards of Agricultural Products and Containers: "One of the elements which is **now lacking** in considerable measure, at least in the procurement of agricultural statistics, is **a basis of standardization** of agricultural products and containers. Standardization of agricultural products and containers is likewise essential to any adequate scheme of marketing and distributing farm products if unnecessary waste and losses in the process of marketing and distribution are to be avoided. The process of distribution will be greatly facilitated by sound and practical standards and grades applied to agricultural products in commerce. Standardization will likewise increase the opportunity of the consumer to secure the exact thing for which

he bargains and to measure the quality of the product which he buys."

"The County Agent and Farm Bureau," thru W. F. Atkinson, Business Manager, Chicago, Illinois: "We are for the metric system first, last and all the time." (This organization also conducts the **National Crop Improvement Press Service.**)

G. W. Norris, Chairman of the Committee on Agriculture and Forestry, United States Senate: "Our present system of weights and measures is so out of date that we ought to take some steps to remedy and better it, and it seems to me the metric system does this. No defence whatever can be offered for our present system. When we broke away from England we very wisely discarded the shilling, pence and pound of the English money system, but we still clung to the old system of weights and measures."

The opinion of experts in Agriculture in favor of the world metric standards is typified by the advocacy of meter-liter-gram by Senator **Arthur Capper,** of Kansas, who besides being prominent in the Agricultural group in the United States Congress is the largest owner of agricultural journals in the world. Hon. **W. S. Kenyon** of Iowa, leader in agrarian legislation, also urges the metric advance. The opinion of **Luther Burbank,** world's greatest grower, is cited earlier in this chapter. He is a member of the Advisory Committee, World Metric Standardization Council.

It should be noted that many Agricultural associations thruout the United States are co-operating in securing the metric standards for merchandising farm products. Among those cited earlier in this chapter are the American Society of Equity, Association of Official Agricultural Chemists, American National Food and Dairy Association, Association of American Agricultural Colleges and Experiment Stations, National Conference of Food, Dairy and Drug Officials, and many others.

The steadily-increasing interest among practical farmers in the world metric standards is typified by several thousand petitions sent by farmers from all parts of the United States, urging passage of the Britten-Ladd Metric Standards Bill. They realize that it facilitates the marketing of their products in the United States of America and thruout the world.

ARMY AND NAVY

The vast majority of Army and Navy officers urge exclusive use of the metric units. In the World War, 4,000,000 American warriors employed metric units in actual practice, and became convinced of their superiority. Quoted elsewhere in this volume are such men as General John J. Pershing, General Leonard Wood, Admiral W. S. Sims, Admiral W. S. Benson, Admiral J. L. Jayne, General Hunter Liggett, General W. C. Gorgas, Colonel Theodore Roosevelt, Colonel Thomas H. Rees, Major F. H. La Guardia, Newton D. Baker, Franklin D. Roosevelt, Benedict Crowell (Director of Munitions in the World War) and many others in the military forces of the United States of America. Hon. Julius Kahn, head of the Military Affairs Committee of the House of Representatives, is an advocate of prompt metric legislation. In the chapter on "Metric Standards Legislation Before Congress" an abstract is given of some of the testimony by Army and Navy officers favorable to gradual metric standardization. (See pages 173-176.)

Major-General J. T. Dickman, Commanding Southern Department, Fort Sam Houston, Texas (11 August, 1919): "I am highly in accord with efforts toward the universal adoption of the metric system and have forwarded petition to the Congressional Committee."

Major-General Wendell C. Neville, Commander of the 4th Brigade, Marines, 2d Division, A.E.F., during the World War: "I favor the exclusive adoption of the metric system in the United States. It is much simpler and easier to work with than any other system yet invented, and it would facilitate commercial relations with many other nations that have already made it their single system of weights and measures."

Captain Charles M. Whitlock, Commanding Officer Edgewood Arsenal, Midland Plant, Michigan (20 February, 1920): "I am heartily in favor of the official and practical adoption of 'Meter-Liter-Gram' and the Metric System, as well as of the world-wide standardization of all such trade facilities as the language and units that are basic on the dealings among diverse peoples."

Edward A. Spitzka, former Lieutenant-Colonel, M. C., U. S. A., New York City (26 April, 1919): "I approve of all movements toward universal adoption of metric system."

W. S. Thayer, Brigadier-General, M. C.; Chief Consultant, Medical Service, A.E.F., 1918-19; Baltimore, Md.: "I am in favor of

anything from prayer to military force to secure the establishment of uniform units of measure. I am mortified that a supposedly intelligent people should be so absurdly conservative."

A. W. Grant, Commandant and Superintendent, U. S. Naval Gun Factory, U. S. Naval Yards, Washington, D. C.: "The Meter-Liter-Gram is practical, as is amply demonstrated."

John H. Soper, Brigadier-General, N.G.H. (Retired), Honolulu, Hawaii (24 June, 1919): "I am greatly pleased to have the opportunity of expressing my hearty approval of the adoption of the metric system by the 2 great English-speaking nations. No argument was needed in my case as I have been in favor of this idea for more than 40 years past."

L. L. Hoare, Lieutenant-Colonel, British Army: "You may be amused at the following story of a conversation of mine with 2 officers of the U. S. Ordnance Dept. with whom I made near friends. I said: 'There is one thing about the U. S. which, when I realized it, filled me with horror and contempt.' This made them sit up and wonder what I was getting at; however, they quite politely asked me what it was, without knocking me down. I replied: 'You use the same ghastly weights and measures as we do.' "

Major John F. Landis, U. S. Military Attache, Caracas, Venezuela (25 November, 1919): "South Americans do not like, understand or care to learn the American and English system of weights and measures and only use them when forced down their throats. The metric system is more systematic, easier to learn and easier to apply than the present. Our foreign commercial competitors use the metric system and have a great advantage over us in South America.

"It stands to reason that an adoption of the metric system could be effected gradually and without any great inconvenience or monetary loss to our industries, and undoubtedly an adoption of this system would eventually lead to a monetary advantage on our part in South America alone far offsetting any possible loss to American industries as feared by some objectors to the same in the United States."

Leonard Lundgren, Captain of Engineers, Army School of the Line, A.E.F., France (22 October, 1918): "I believe that if this war lasts long enough, the elementary use that our soldiers are making of the Metric System in France will result in its universal use in the United States."

Henry A. Reed, Brigadier-General, U.S.A. (Retired): "Money measurement is so universal that common sense forced us to break away from our cumbersome English standards, to our everlasting comfort and convenience. Now let us give common sense, convenience and comfort, reduction of time and labor and the decimal point a chance, and get rid of the difficult conversion of different units and of quantities by discarding the rest of the English standards, and adopting the Metric, or Decimal system."

W. D. French, Major, Air Service; Air Service Headquarters, Morrison, Virginia: "The International Millionth Map is to be upon the metric scale."

Frank G. Bolles, Lieutenant-Colonel, Ordnance, Member War Department Claims Board, Washington, D. C. (10 June, 1919): "A study of the subject will clearly show that, beyond a small percentage of those engaged in manufacture whose products are for local consumption, and who fail to grasp the tremendous advantages to be derived from the use of the Metric System as a means of simplifying the work of production and distribution of our own products, there is no valid argument against its immediate use to the exclusion of the complex system we persist in continuing.

"United States money is already metric. Our factories and workmen, during the last 5 years, due to production of war materials, have become familiar with the Metric System.

"While Germany originated our complex system (see Vol. 9, Transactions Royal British Historical Society), Germany forever dispensed with its use in 1871 for the Metric System."

Others in the armed forces of the United States of America, typical of those urging gradual metric standardization of weights and measures are:

P. C. Harris, Adjutant-General, United States Army, Washington, D. C.; Major-General Peter E. Traub, Camp Pike, Arkansas; Samuel McGowan, Paymaster-General of the Navy; Rear Admiral T. W. Kinkaid, Annapolis, Maryland; R. H. Jackson, Rear Admiral Naval War College, Newport, R. I.; Major Fiorello H. La Guardia; E. B. Babbitt, Brigadier-General, U.S.A., Camp Dodge, Iowa; Mordecai Crawford, Brigadier-General, U.S.A., Washington, D. C.; General William Crozier, Chief of Ordnance; Louis V. Caziare, Brigadier-General, U.S.A., retired; Major Emer Yeager, United States Field Artillery, Camp Benning, Georgia; Lieutenant Newton Bishop Drury, U.S.R., during the war Officer in Charge of Flights, U. S. Balloon School, Arcadia, California; Captain Harold P. Nachtrieb, U. S. Marine Corps, in 1918 aide to Major-General Barnett, Commandant; Major Edgar H. Brown, M. C.; Major E. L. Wemple, M. C.; Major H. A. Kluegel, Construction Division, U.S.A., and thousands of others.

BANKERS AND BANKING INSTITUTIONS

J. T. Holdsworth, Economist and Vice-President, Bank of Pittsburgh, N. A., Pittsburgh, Pa.: "There are no valid arguments against the metric system."

Farmers' State Bank, Montague, Michigan (26 October, 1919): "*Resolved,* that we respectfully urge that the units of the metric system be adopted by the Congress of the United States of America and the British Parliament as the exclusive legal standards of weights and measures."

J. W. Gregory, President, Cottage Grove Bank, Des Moines, Iowa: "The undersigned begs to join with those who are urging the provision of legislation which will most quickly bring about the exclusive use of the decimal system, commonly referred to as the metric system, as applied to weights and measures, by the United States of America. Our national experience with our decimal coinage system should have made us leaders instead of disgraceful laggards in the movement to make these decimal systems of weights and measures world-wide, time-saving and unifying agencies."

Theodore Wold, Vice-President, Northwestern National Bank, Minneapolis, Minnesota (17 January, 1921): "If I can be of any assistance to the metric advance, I shall be very happy to render it."

Andrew J. Fraun, President, Waukesha National Bank, Waukesha, Wisconsin: "There appears no sound reason for not making a wonderful saving of time—and time is money—by adopting the metric as against all other systems of weights, measures and money. As less advanced nations have adopted it, it is inconceivable why Britain and the United States still cling to such antiquated methods. Therefore, may we ask, why not keep step with the best progress of the world?"

W. R. Williams, of the Bank of Italy, San Francisco, California: "I have for some time been a strong advocate of the metric system, and I certainly hope for success in the very near future."

George L. Ramsey, President, The Banking Corporation of Montana, Helena, Montana: "I have always been in favor of the metric system and will become a talking advocate in its favor."

Such eminent bankers as Otto H. Kahn, James Speyer and John J. Arnold are quoted elsewhere in this volume. (Consult Index.) The following list, which could be greatly extended, will indicate the unanimity of bankers (who have, of course, constant contact with the convenient decimal system of money) in favor of the decimal system of weights and measures:

I. N. Ballard, President, Bank of Greenville, Greenville, W. Va; C. W. Banta, Wells Fargo Nevada National Bank, San Francisco; H. A. Bent, President, Oglesby State Bank, Oglesby, Illinois; Frank W. Blair, President, Union Trust Company, Detroit, Mich.; John Bowen, President, First National Bank, Windsor, Mo.; Joseph M. Boyd, President, Bank of Wisconsin, Madison, Wis.; Henry Clark Bridgers, President, First National Bank, Tarboro, N. C.; E. O. Brown, President, Merchants' State Bank, Rhinelander, Wis.; W. J. Clarke, President, Emmet County State Bank of Michigan, Harbor Springs, Mich.; John Clausen, Vice-President and Director, Mexico City Banking Corporation; R. P. Cooke, President, The Hernando Bank, Hernando, Mississippi; Walter H. Creber, President, The Rogers Park National Bank, Chicago, Ill.; G. A. Dayton, President, State Trust & Savings Bank, West Chicago, Ill.; C. P. Deming, President, The Peoples' Bank of Evergreen, Ala.; Guy E. Dobson, President, First National Bank of Redmond, Redmond, Ore.; R. J. Donahue, President, The National Bank of Ogdensburg, Ogdensburg, New York; First National Bank of Boulder, Boulder, Colo.; First National Bank of Clarkston, Wash.; J. A. Foster, President, The Union State Bank, Calvert, Tex.; R. N. Fredericks, President, The Prescott State Bank, Prescott, Ariz.; W. H. Frey, President, The Farmers National Bank, Stephensville, Tex.; J. A. Gelbach, President, First National Bank, Ellwood City, Pa.; C. H. Gilliland, President, Peoples Trust & Savings Bank, Goodwater, Ala.; W. H. Gold, President, State Bank of Redwood Falls, Redwood Falls, Minn.; Orville B. Gorin, President, the Millikin National Bank, Decatur, Ill.; C. E. Greene, President, The First National Bank, Richmond, Mich.; B. W. Griffith, President, The First National Bank of Vicksburg, Vicksburg, Mississippi; B. Hadley, President, The First National Bank, Cambridge, Ill.; A. H. Hale, President, The First National Bank, Manchester, New Hampshire; J. F. Hardin, President, Citizens' Savings Bank, Eldora, Iowa; Chas. K. Hart, President, Prosser State Bank, Prosser, Neb.; A. Barton Hepburn, Chairman of the Advisory Board, The Chase National Bank, New York City; V. L. Highland, President, The Empire National Bank, Clarksburg, West Va.; C. J. Hogeboom, President, First State Bank, Warner, South Dakota; A. W. Hurley, President, Citizens' National Bank, Pawhuska, Okla.; N. Iverson, President, Mohall Security Bank, Mohall, North Dakota; Henry E. Jewett, President, Second National Bank, New Albany, Indiana; Chas. Johnsen, President, Citizens' State Bank of Lake View, Chicago, Ill.; C. P. Jordan, President, First Savings Bank, Sutherland, Iowa; H. R. Kibbee, President, Commercial Trust and Savings Bank, Mitchell, South Dakota; L. V. Koontz, President, The First National Bank, Clendenin, W. Va.; J. Luchsinger, President, The Citizens' Bank, Monroe, Wis.; Frank S. Lusk, President, The First National Bank, Missoula, Mont.; J. A. Magoun, President, Northwestern National Bank, Sioux City, Iowa; M. A. McCutchen, President, American National Bank, Shreveport, La.; J. C. McGinnis, President, First National Bank, Frackville, Pa.; Wm. L. Moore, President of Washington County Bank, Banks, Oregon; N. P. Moss, President, The First National Bank of Lafayette, Lafayette, La.; A. W. Murphy, President, The Shenandoah National Bank, Shenandoah, Iowa; R. L. Myers, President, Lemoyne Trust Company, Lemoyne, Pa.; Sigmund Ojserkis, President, The Boardwalk National Bank, Atlantic City, N. J.; The Peoples National Bank, S. R. Stevens, President, Marlborough, Mass.; G. A. Pestal, President, The Merchants' State

Bank, Winside, Neb.; Frank J. Pouska, Cashier, Home Savings Bank, Fort Atkinson, Iowa; G. B. Quarles, President, The Citizens' National Bank, Salmon, Idaho; J. M. Raynolds, President, The First National Bank, Albuquerque, New Mexico; A. C. Robinson, President, Peoples' Savings and Trust Co., Pittsburgh, Pa.; W. C. Soles, President, The National Bank of McKeesport, McKeesport, Pa.; A. D. Stephens, President, The Merchants' National Bank, Crookston, Minn.; A. L. Stone, President, State Bank of Dillon, Dillon, Mont.; M. E. Uggen, President, Citizens' State Bank of Epping, Epping, North Dakota; C. D. Waggoner, President, The Bank of Telluride, Telluride, Colo.; Benjamin L. Webb, President, Cortland Savings Bank, Cortland, New York; E. P. Willey, President, First National Bank, Chelsea, Iowa; E. W. Wilson, Governor, Philippine National Bank, Manila, P. I., (In 1919-1920, Vice-President, World Trade Club); A. A. Wilson, Asst. Mgr., The Canadian Bank of Commerce, San Francisco, Calif.; G. A. Wilson, President of Wilson Banking Company, Greenwood, Miss.; Sinclair A. Wilson, President, The First National Bank, Linnton, Oregon; L. C. Woodfill, President, Farmers and Merchants Savings Bank, Gravity, Iowa; C. H. Worden, President, The First and Hamilton National Bank, Fort Wayne, Ind.; Albert Zimmermann, President, First State Bank of Arlington, Arlington, Minn.; R. Calvert Haws, Editor, "Successful Banking," Benton Harbor, Michigan; Albert G. Hammel, Commissioner of Finance, Saginaw, Michigan; G. H. Richards, Secretary, Minnesota Bankers' Association, Minneapolis, Minnesota.

INSURANCE

C. H. Jackson, Superintendent of Agencies, Security Mutual Life Insurance Company, Binghamton, New York: "We are very glad to co-operate in any way we can with so wise a measure. Our feet cannot be set on the right path in many of these worldwide matters any too soon."

T. F. Millett, Secretary, Dirigo Mutual Fire Insurance Co., Gorham, Maine: "Anything I can do in the direction of the metric advance, as I believe it a very important thing, I will gladly do."

S. A. Olsness, Commissioner of Insurance, State of North Dakota: "It was indeed gratifying to me, having been brought up under the metric system in Europe, to learn that a vigorous campaign is launched to introduce it in this country."

D. J. Cooper, Equitable Life Assurance Society of the United States, New York City, N. Y.: "We would like to help in bringing about the worldwide use of the metric system."

C. E. Hydes, Marine Insurance Department, Fireman's Fund Insurance Company, San Francisco: "For manifest reasons, Marine Insurance experts favor world standardization of weights and measures, and the scrapping of confusing local standards which hinder the transaction of world business."

Walter C. Faxon, Vice-President, Aetna Life Insurance Company, Hartford, Conn. (8 August, 1919): "It affords me great pleasure to add my endorsement to the many others for the enactment of such legislation as may be necessary to accomplish the adoption in the United States of America of the metric system exclusively for all weights, measures and for coinage."

C. E. Affeld, Jr., Affeld, Tonk & Co., Insurance Agents, Chicago (15 May, 1919): "At a committee meeting of the Chicago City Club I was handed the convincing circular of the World Trade Club on the Metric System of weights and measures while introducing a proposition to compel all packages of liquids or solids now marked by our weights and measures to be marked with its equivalent in the metric system, thus familiarizing the public with the system and eventual adoption."

From the long list of Insurance organizations urging the metric advance, we may cite the American Bankers Insurance Company, Chicago, Illinois; Armstrong Agency, Insurance, New York City; Home Insurance Company, New York City; Ohio State Life Insurance Company, Columbus, Ohio; Pacific Mutual Life Insurance Company, Los Angeles, California; Prudential Insurance Company, Newark, New Jersey, and many others. The eminence of Hon. **Joseph S. Frelinghuysen** in the world of Insurance, is well known. It was he who presented the Metric Standards Bill of 1920; and this progressive measure was endorsed by Insurance men thruout the United States of America. (See quotation from **"Rough Notes,"** page 257.)

LAWYERS AND JURISTS

Among the eminent lawyers and jurists quoted elsewhere in this book are Elihu Root, William G. McAdoo, John Barton Payne, Frank L. Polk, Franklin K. Lane, Franklin D. Roosevelt, and many others.

Edgar V. Werner, Judge of the Circuit Court, Shawano, Wisconsin: "I am very much interested in the propaganda for the betterment and the equality of commercial dealings. The laudable ambition of the World Trade Club should be considered by every good American citizen."

W. L. Seabrook, State's Attorney, Westminster, Maryland: "The argument of the World Trade Club appears to me unanswerable."

C. de Smedt, L. L. D., Attorney-at-Law; Vice-Consul of France, Galveston, Texas: "The demand for the Metric System should be sustained by every sensible man. The metric movement is sure to succeed."

H. W. Glensor, Commerce Attorney; President, Foreign Trade Club of San Francisco (World Trade Club): "Simple and rational

terminology in weights and measures is necessary to free us from our present confusion, which is worse than most people realize. The metric units are not only the simplest and most convenient, but above all they are the world units on which all nations are standardizing. Practical use of the meter, liter and gram, while in the Army, first in the Philippines and later in France during the World War, convinced me of their superiority and utility."

James Watson, County Judge of Coos County, Coquille, Oregon: "I have often wondered why the metric system wasn't universally adopted by the world, being so very convenient and efficient."

A. C. Stein, Attorney-at-Law, Pittsburgh, Pa.: "All my life I have been wondering what power could keep in force our crazy method of weights and measures."

Clarence M. Oddie, Attorney and Counsellor-at-Law, San Francisco, California: "I am very heartily in favor of this cause."

H. Walter Huskey, Attorney and Counsellor, Reno, Nevada: "For 10 years I taught the metric system in the public schools. I am very glad to join in any effort within my power to secure this reform at this time of world adjustment of such matters."

W. B. Dillard, Attorney, St. Helens, Oregon: "I have known erroneous land descriptions ending in lawsuits; building material miscut and wasted; buildings wrongly located; bridges rendered dangerous, and storage room sadly miscalculated, owing to confusion in units of measure. In fact, the terms chains, rods, poles, links, yards, feet and inches are often used in the same description taken from adjacent surveys, and are confusing even to an experienced person.

"What is applicable to linear measure is equally applicable to bulk and weight. No wonder that about half our people are sadly incapable of forming estimates on subjects with which they should be familiar as with dollars, dimes and cents. I should say that a mixed and confused manner of calculating distance, bulk and weight has always been an impediment to clear understanding among English speaking people. Language is but the clothing of thought; but by clarifying the expression of thought we clarify thought itself."

E. S. Cobb, Attorney, El Paso, Texas (24 February, 1920): "During the time that I was Collector of Customs at El Paso I was so strongly impressed by the need for the United States adopting this system that I submitted a carefully prepared report on the subject to the Secretary of the Treasury."

Theodore Sutro, Eminent Lawyer, Senior Member of Law Firm of Sutro & Wright, New York City (8 March, 1920): "I have for many years advocated a uniform system of weights and measures among all the nations, as far as possible, and I am now even more in favor of this than at any time. The metric system would be the solution of this idea. It is not only that such a uniform system of weights and measures would be of great convenience in correspondence and otherwise, but would make, the same as any universal habit or custom among the countries of the world, for bringing them closer together, and tend to prevent disputes and misunderstandings, and thus, in consequence, avert serious conflicts and war."

Ralph M. Snyder, associated with the law offices of Rummler & Rummler, Chicago, by experience is competent to judge whether or not the international metric system is simpler and more effective than our present system of weights and measures. He writes (21 May, 1919): "My experience as Adjutant of the Aviation Repair Depot at Indianapolis, where we were concerned largely with local and foreign measurements in the building of airplanes and parts, convinces me of the urgent necessity of the adoption of the meter-liter-gram in this country. This conclusion is also compelled by reason of the difficulties of the present system in Patent Soliciting and Patent Litigation, and the experiences of our clients who are confronted with the difficulties of the old system."

Stansbury Hagar, Counsellor-at-Law, New York City: "I am in hearty sympathy with the purpose of securing the early world-wide use of meter-liter-gram."

Andrew J. Branagan, Attorney and Counsellor-at-Law, San Francisco, California: "Standardization would justify the adoption of the metric system, but when you add to that the high degree of merit which it possesses of itself, the arguments for its adoption become unanswerable."

Matthew Brady, District Attorney, City and County of San Francisco, California: "I sincerely hope that this important advance in efficiency will meet with a ready response from all national organizations."

Among the other lawyers and jurists who have endorsed the metric progress may be mentioned: W. H. Crichton Clarke, General Counsel, Kellogg Toasted Corn Flake Company, New York City; Frank C. Drew, Balboa Building, San Francisco, California; Francis B. James, noted Interstate Commerce attorney, Washington, D. C.; S. W. King, Federal Judge, Chicago, Illinois; D. H. Ingraham, former Mayor, Portland, Maine; Henry Orth, Patent Attorney, Washington, D. C.; Rice & Lyons, Tulsa, Oklahoma; William G. Marvin, of Marvin & Pleasants, 120 Broadway, New York City;

O'Donnell & Graham, Denver, Colorado; Frank J. Loesch, President of Chicago Bar Association, 1906-7, Counsellor-at-Law, Chicago, Illinois; H. H. Phleger, San Francisco, California; L. E. St. John, Judge, Miami County, Ohio; Staunton J. Peelle, Chief Justice, United States Court of Claims, 1906-1913, Washington, D. C.; Lindley D. Clark, Legal Expert, U. S. Bureau of Labor Statistics; Robert T. Ervin, Judge, United States District Court, Southern District of Alabama, Mobile, Alabama; A. Bruce Hopkins, Buffalo, N. Y.; Clyde M. Gandy, Assistant Attorney General, State of Arizona, Phoenix; F. E. Pailard, Assistant Attorney General, State of North Dakota; Willard W. Miles, Justice of the Supreme Court of Vermont, Barton, Vermont.

CLERGY AND RELIGIOUS CONGREGATIONS

Church of Christ, Macy, Indiana: "The congregation voted unanimously to endorse legislation that will bring about the exclusive use of meter-liter-gram by the United States of America."

Rev. J. Rivera, Canovanas, Porto Rico: "I am a warm advocate of the metric system and its promotion."

Rabbi Emanuel Sternheim, Sioux City, Iowa: "I am in deepest sympathy."

William F. Weir, General National Secretary and Treasurer, Men's Work, Presbyterian Church: "I favor the gradual adoption of the decimal metric standards of weights and measures in the United States, during a transition period of 10 years."

Rev. Joseph R. Crimont, Bishop of Alaska, Juneau, Alaska: "Yours is a movement in the right direction."

Rev. Martin Branagan, Perry Green, Michigan: "I have striven on all occasions to heap ridicule on the existing system and to urge the adoption of the decimal metric units."

Rev. B. H. Taylor, Pastor of the Ganson Street Baptist Church, Jackson, Michigan: "I wish to say that my church stands for the adoption of the meter-liter-gram system in the United States and its exclusive use therein."

Rehobeth Baptist Church, Rehobeth, Maryland (18 September, 1919) voted resolutions unanimously urging Congress to adopt meter-liter-gram as the exclusive legal standards of weights and measures in the United States of America.

Rev. C. M. Worthington, Missionary, Methodist Mission, Singkawang, West Borneo (10 January, 1920): "As an American missionary of the Methodist Episcopal Church having had nearly 20 years experience in teaching the English language to Chinese, Malay and Tamil children, and having to deal with Chinese, Malay and European merchants and officials, I heartily endorse any measures that may be taken to introduce and enforce the use of the

Meter-Liter-Gram system not only by the United States of America but by all nations of the world."

A. R. Thompson, Presbyterian Missionary, Mayaguey, Porto Rico (20 September, 1919): "From my 10 years' experience here with the metric system, I realize the very great advantage this has over our antiquated and expensive systems; and certainly now is the time to effect this advance."

G. C. Brinkman, Clergyman, Elkin, N. C. (27 February, 1920): "I am heartily in favor of the metric system, having been in business before I became a minister."

Southern Baptist Theological Seminary Library, Louisville, Ky.: "We are in fullest sympathy with the effort to have the United States adopt Meter-Liter-Gram."

Dr. Frank G. Lewis, Librarian, American Baptist Historical Society, Chester, Pa. (1 March, 1920): "It is a pleasure to share with the large majority, I think, of thoughtful and practical Americans, the wish that the Metric System may soon become for the United States not only allowed, but exclusively used in our affairs."

George Rutger Brauer, Treasurer, Board of the Church Erection Fund of the General Assembly of the Presbyterian Church in the United States of America, New York City: "It seems to me that it would be of a great advantage for both the United States of America and the British Empire to adopt this system and thus have uniform systems of weights and measures for all the nations of the world."

Francis B. Nash, Acting Rector, Trinity Episcopal Church, Chicago, Illinois (3 September, 1919): "For 40 years I have advocated this common sense union with all the rest of the civilized world in the immensely important matter of weights and measures. As a student of history all my life I have seen the foolishness of our standing aloof with our awkward, misbegotten and absurd system of weights and measures, and as a man who has been much concerned and active in agricultural production I have long seen the deplorable error, from every standpoint, save the immediate convenience of shrinking the inevitable in changing systems, of our obstinate refusal to make the world of business, manufacture, production and transportation unanimous in this profoundly important concern."

Paul de Schweinitz, D. D., Bethlehem, Pennsylvania: "I am most heartily in favor of the metric system and have been for years."

H. B. King, Evangelical School Press, Samokov, Bulgaria: "Let the necessary legislation be hastened! Standardized weights

and measures cannot come too soon for me. No reasonable man can oppose such obviously beneficial changes as this to the metric system."

L. W. Rogers, National President, Theosophical Society, American Section, Los Angeles, California: "Speaking merely for myself, I favor the gradual adoption of the decimal metric standards in commercial transactions."

Henry Smith Leiper, American Board Mission, Tientsin, China: "Living in an international center such as Tientsin, I appreciate the need for a world standard—the metric system."

Among the thousands of clergymen, missionaries and religious congregations which have urged the metric advance are: Walter Bishop Bell, Minister, First Presbyterian Church, Port Townsend, Washington; William Edward Cox, Rector, Church of the Holy Comforter, Richmond, Virginia; Ozora S. Davis, President, Chicago Theological Seminary, Chicago, Illinois; Charles C. Jacobs, Centenary Methodist Episcopal Church, Charleston, S. C.; C. A. Jessup, Rector, St. Paul's Church, Buffalo, New York; J. M. Koudelka, Bishop of Superior, Wisconsin; I. W. Lowrie, Chairman, the China Council, American Presbyterian Mission (North), 18 Peking Road, Shanghai, China; Saint Philip Benize's Church, Chicago, Illinois; Clinton Senneff, First Methodist Episcopal Church, Crawford, Nebraska; R. Shemeld, Bethany Chapel of New York Avenue Presbyterian Church, Washington, D. C.; Frederick J. Stanley, D. D., L. H. D., Newburgh-on-Hudson, N. Y.; H. F. Swartz, General Secretary, Congregational World Movement, New York City; E. H. Wilcox, Director, Adventists Mission, Lima, Peru; W. C. Paige, General Secretary, Young Men's Christian Association, Houston, Texas; R. G. Galyards, Secretary, Reorganized Church of Jesus Christ of Latter Day Saints, Independence, Missouri; W. I. Haven, General Secretary, American Bible Society, Astor Place, New York City; and many others.

EDUCATORS

The fact that Educators are virtually unanimous in favor of the decimal metric system is well known. Opponents use this as an argument **against** the metric system; and it is of the same quality as all of their contentions. Surely, those who have occasion to investigate and study both the metric system and the cumbersome jumble we now have, should be in the very best position to advise the nation as to which is superior. They are the experts on this subject, and their overwhelming verdict for the logical decimal units should be conclusive.

Already in this volume we have seen that such educational leaders as Charles W. Eliot, Nicholas Murray Butler, George E. Vincent and Arthur T. Hadley are strongly in favor of prompt adoption of the metric system. The opinion of the International

Correspondence Schools, and similar institutions, has also been cited. Before instancing typical support from Educators, it will be well to quote the Resolution passed unanimously by the National Congress of Mothers and Parent-Teacher Associations, in Washington, D. C., April, 1921:

"*Whereas*, it is generally agreed that the present system of weights and measures used in the United States is cumbersome and a hindrance to the American school children; and *Whereas*, American educators are practically unanimous in favoring the replacement of the present system with the international metric system of weights and measures; and *Whereas*, statistics show that practically one year in the school life of every American child could be saved if the decimal metric system of weights and measures were taught instead of the present system; and *Whereas*, the enormity of loss in time and money can be somewhat appreciated when it is remembered that, according to the statistics of the United States Bureau of Education, there are about 22,000,000 public school children in our country being educated at a cost of not less than $800,000,000 per year; and *Whereas*, the metric system of weights and measures is the simplest system yet devised and used almost exclusively in 36 nations of the world; Now, therefore, be it *Resolved*, That the National Congress of Mothers and Parent-Teacher Associations favor the enactment of legislation calling for the complete adoption of metric weights and measures in the best way for all concerned." (The National Congress of Mothers and Parent-Teacher Associations comprises a membership of over 250,000, and is organized in 40 States of the Union.)

The opinions of Educators in favor of the metric units are so well known that it is needless to present more than a representative selection:

P. P. Claxton, when United States Commissioner of Education, Washington, D. C., (11 May, 1920): "Because of its general use in scientific investigations and writings, its wide and increasing use in commerce, its ease and economy in time, money and labor in making calculations in its terms, and the large saving in the time of children in learning it and of school funds in teaching it instead of the complex and unscientific measurements now in common use, I am most heartily in favor of the general adoption of the metric system of weights and measures to the exclusion of all other systems."

George E. Vincent, former President University of Minnesota; and President of the Rockefeller Foundation (12 December, 1919): "With the metric system I am personally in hearty sympathy."

David Starr Jordan, President Emeritus, Stanford University, California: "All weights and measures serve convenience; the metric system being decimal is incomparably most convenient, and would make its way at once if officially proclaimed. The old system only holds on by the curious clinging to antiquated forms inherited by America from England. We should by all means adopt the world system."

David Prescott Barrows, President of the University of California, Berkeley, California: "I favor effort to secure adoption of the metric system by the United States in the interest of our commerce, our science, and our common life."

University of Oregon, Eugene, Oregon, thru **P. L. Campbell,** President: "The faculty of the University of Oregon respectfully urges that the metric system be adopted by the Congress of the United States of America and by the British Parliament as the exclusive legal standard of weights and measures."

C. M. Farmer, Professor of Natural Sciences, Lynchburg College, Lynchburg, Virginia: "It seems to me that in setting forth the ease with which the metric system can be learned and used college students in science could be cited as an effective example. Starting with no knowledge of these units, in an incredably short time they develop a remarkable familiarity and skill in their use. In Lynchburg College there is not a yardstick, foot rule, pound weight, or gallon, used in demonstration, or in our science laboratories. The metric units are used exclusively. When students want to translate they are told that it is desired that they get the "poison" all out of their system and think in terms of metric units only. The same familiarity and "feeling" for the metric units as college students so quickly develop would, in a very short time, obtain among people generally."

William B. Bentley, Head of the Department of Chemistry, Ohio University: "All scientific men are interested in the metric system. No greater good could come to American Manufacturers in their efforts to become a principal factor in South American trade. In fact, meter-liter-gram is absolutely necessary."

J. B. Woodworth, Chairman, Department of Geology and Geography, Harvard University: "All the earthquake stations use the metric system in reporting and calculating the data regarding near and distant earthquakes."

Albert Bushnell Hart, Expert in Government at Harvard University: "The metric system is one of the world's conveniences. It was recognized by the United States of America 100 years ago in coinage. It is almost essential for the expansion of our world

trade, avoiding millions of errors in calculations and changes. The country should take immediate steps toward its adoption as the standard."

R. P. Bigelow, Librarian, Massachusetts Institute of Technology: "I thoroughly approve of the universal use of the metric system and should be glad to support a movement toward the universal adoption of that system."

M. E. Ahern, Librarian, Public Libraries, Chicago, Illinois: "I am glad to see concerted action on the part of the business men to support this measure. It seems a most propitious time for action along this line when thousands of boys have returned from France speaking of kilometers, liters, meters, and so on."

Carrie Chapman Catt, Educator; President, National American Woman Suffrage Association (8 March, 1921): "I am myself very heartily in favor of a standardization of weights and measures for the world."

Frederick A. Spafford, Flandreau, South Dakota (20 February, 1921): "The Regents of Education of the State of South Dakota, of which I am a member, sent a memorial to our Congressmen asking that they support metric standardization of weights and measures."

Melvil Dewey, Pre-eminent Librarian, and originator of the Dewey Decimal Classification; founder of New York State Library School; former Chancellor of the University of the State of New York (5 March, 1921): "I am hammering for the metric cause wherever I get a chance."

Walter Scott Perry, Director, Pratt Institute, Brooklyn, New York: "The movement for metric standardization ought to have a great influence for good."

L. J. Paetow, Professor of History, University of California: "The meter-liter-gram system will supersede our present barbarous system of weights and measures as certainly as the day follows the night."

Albert Shiels, former Superintendent of Schools in Los Angeles, California, and in New York City: "The adoption of the metric system would greatly simplify the whole problem of instruction among the children of the nation. Our curriculum is overloaded, and the saving of thousands of hours now devoted to the clumsy and complex arithmetic of the present type could be used for other educational purposes."

T. F. Phillips, Head of the Department of Science, Duluth Central High School, Duluth, Minnesota (10 September, 1919): "Next to the World War, adoption of metrics would be the biggest thing America ever did."

John H. Muykeus, Professor of Phonetics, Kennedy School of Missions, Hartford, Connecticut (23 February, 1920): "In France I learned that the children 10 years of age in computing arithmetic problems arrived at the correct result with greater ease than the 9th and 10th grade pupils in our country who are compelled to use our present hodgepodge of weights and measures. . . . We live for our children, or we have not understood either life or American Institutions. Let us adopt the metric system—let standpatters kick!"

Thomas A. Edison, world's greatest inventor: "Make a child study what it does not like, and keep this up until it is 14 years old, and its brain is impaired forever." (Edison's denunciation of what he calls "our present jumble" of weights and measures, has been quoted elsewhere.)

Elias Silberstein, Principal in New York Public Schools: "I have always felt that at least a year could be saved in the arithmetic course if the archaic system of weights and measures was supplanted by the decimal system."

Florian Cajori, Professor of Mathematics, University of California: "It is a paradox that a nation in most respects so progressive as is the United States should be so far behind in the adoption of the metric system. Even little Switzerland has been able to make the change. Educationally, the gain would be great. The time is approaching when commercial considerations demand adoption."

Isaac Taylor Headland, Professor of Missions, Wesley College, Alliance, Ohio; author on China, and Chautauqua Lecturer: "For several years past in one of my lectures on China I have given expression to the following sentences: 'We have the worst system of weights and measures in the Christian world, a system in which we compel our children to learn that there are 16 parts, or 8 parts, or 4 quarters in an inch, and 12 inches in a foot instead of 10, and 3 feet in a yard, and 5½ yards or 16½ feet in a rod. Why could we not make a rod with an even number of feet in it and make arithmetic easy for the children? Then we have 16 ounces in a—or 12 ounces—how many ounces do we have in a pound? And we could not make a pound with a definite number of ounces in it—and we cannot discard this old system for a metric system that is already made to our hand. And England, with the worst monetary system in the Christian world—her pounds, shillings, pence—a system which she recognizes to be so bad that she will not advise a single colony she establishes to adopt it. And she can't discard it. Yet since I went to China (1890) she has discarded an educational system which she spent 1000 years and more in develop-

ing, the basis of which was Confucianism, and has adopted the system introduced into China by the missionaries from Europe and America!' Cannot we rise to the progressive spirit of China, and adopt the meter-liter-gram and make mathematics easy for our posterity? With all my heart I approve of the exclusive use of the 'meter-liter-gram' by Great Britain and the United States of America, my father's country and my own, and I would be willing to devote all my energy to the bringing about of such a change."

Theodore Hough, Dean of Department of Medicine, University of Virginia, Charlottesville, Va.: "I regard this adoption of the metric system by the English-speaking world as a very urgent matter."

D. N. Lehmer, Professor of Mathematics, University of California, Berkeley, Calif. (19 Feb., 1920): "I shall leave no stone unturned in educating the youth who are to be our business men as to the stupidity and folly of clinging to our chaotic jumble of units."

Michigan State Normal College, thru C. P. Stemle, Secretary-Registrar (13 Feb., 1920) unanimously favors legislation that will bring about the exclusive use of metric units by the United States of America.

F. I. Cooper, Chairman, Committee on Standardization, National Education Association (18 Feb., 1920): "I am thoroly in favor of the use of the metric system. I shall do what I can to urge its general adoption."

W. C. Brown, Superintendent, Louisville Industrial School, Louisville, Ky.: "As an educator in the class room and as an administrative and executive officer of schools and institutions, my observation and experience impels me to the conclusion, that there should be only one system; and of all the metric is the best adapted for the purpose. In this day of striving for single standards, let us not overlook the sore need for adjustment in this department of applied practical science and economics."

H. V. Arny, Professor of Chemistry, Columbia University: "World science stands 100% for metric units."

W. N. Gladson, Dean of Engineering, University of Arkansas: "There is no question in my mind as to the advantages of this system over our present clumsy English system of weights and measures, and the ultimate benefits to be derived by our adoption of the system will outweigh the costs and inconveniences of making the change."

E. W. Kemmerer, Financial Expert and Contributing Editor; Professor of Economics and Finance, Princeton University (14

February, 1920): "In my judgment, the nation-wide adoption of the metric system of weights and measures is desirable at as early a date as practicable. The present time, when the entire business world is adjusting itself to new standards would seem to be a particularly opportune time for making progress in this direction."

Joseph V. Collins, Department of Mathematics, State Normal School, Stevens Point, Wisconsin: "The learning of arithmetic thru the medium of our present crude weights and measures is equivalent to fastening a ball and chain to every child in school. In countries using metric weights, arithmetics are no more than half the size of those in use in non-metric countries, with a corresponding diminution in the time needed for the study. On account of the so-called enriching of the course of study by the introduction of other studies besides the 3 R's, the time given to arithmetic has been steadily cut down, with a corresponding weakening in the standard of attainment. A great cry has gone up over the country because of the poor preparation of the rising generation in arithmetic. With metric arithmetic in use, the new studies could be retained and the old arithmetic standard brought back.

"The 3 million children that leave U. S. American schools each year are denied from 1/3 to 2/3 of a year of additional schooling, dependent on the amount of time given to arithmetic. When it is remembered that added schooling means added earning power, it is apparent that several hundreds of millions of dollars are lost to America every year by the retention of our antique weights and measures that came down to us from the German Hanseatic League. This estimate evidently takes no account of the troubles brought upon innocent childhood in trying to learn a preposterous hodge-podge of numbers and calculations, nor of the children that drop out of school before their time because they cannot learn the crazy arithmetic."

There are literally hundreds of thousands of Educators thruout the United States of America working in behalf of the logical metric units. On record with the Department of Commerce, Washington, D. C., there are the petitions of 37,244 Educators who urge the gradual metric advance. Many of the names within the present book, especially in the sections on Science and Engineering, are those of Educators; and many more are listed in World Trade Club booklets 4 and 9.

Here are some of the many Educators and Educational Institutions urging exclusive use of meter-liter-gram: John R. Allen, Dean, College of Engineering and Architecture, University of Minnesota; C. H. Allender, Superintendent, Gass Lake Indian School, White Earth, Minnesota; Dr. W. G. Anderson, Professor and Director of Yale University Gymnasium, New Haven, Connecticut; G. A. Anderson, President, Augustina College and Theological Seminary, Rock Island, Illinois; G. H. Apple, President, Hood College, Frederick, Maryland; Raymond F. Bacon, Mellon Institute of Industrial Research, University of Pittsburg, Pittsburg, Pennsylvania; Milton Bennion, Dean, School of Education, University of Utah, Salt Lake City; J. R. Benton, Dean of the College of Engineering, University of Florida, Gainsville, Florida; Dr. George Blumer, Dean of the Medical Faculty, Yale University, New Haven, Connecticut; Board of Education, Canton, Ohio; Board of Education, Zanesville, Ohio; Board of Education, Genevieve, Missouri; Charles S. Brown, Professor of Mechanical Engineering, Vanderbilt University, Nashville, Tennessee; Henry A. Buchtel, Chancellor, University of Denver, Denver, Colorado; W. W. Campbell, Director, Lick Observatory, California; F. C. Caldwell, Professor, Department of Electrical Engineering, Ohio State University, Columbus, Ohio; Laura A. Carnell, Dean, Temple University, Philadelphia, Pennsylvania; Frank W. Collier, Director of Research, American University, Washington, D. C.; Melvin L. Collins, President, Louisiana Collegiate Institute, Shreveport, Louisiana; Colorado Agriculture College, Faculty Club, Nellie M. Kilgore, Secretary; A. G. Crane, President, North Dakota State Normal School, Minot, N. D.; Dr. Harvey Cushing, Professor of Surgery, Harvard University, also Surgeon-in-Chief, Peter Bent Hospital, Boston, Massachusetts; Richard D. Currier, President, New Jersey Law School, Newark, New Jersey; Edward Ellery, Dean of the Faculty, Union College, Schenectady, New York; Frank A. Fetter, Professor of Political Economy at Princeton University; J. H. Frandson, Professor and Head of the Department of Dairy Husbandry, College of Agriculture and Experiment Station, University of Nebraska, Lincoln; Edwin B. Frost, Director of Yerkes Observatory, University of Chicago, Williams Bay, Wisconsin; H. M. Gage, President, Huron College, Huron, South Dakota; Garrett Biblical Institute, Charles M. Stuart, President, Evanston, Illinois; Sidney G. Gilbreath, President, East Tennessee State Normal School, Johnson City, Tennessee; Girls' Collegiate School, Los Angeles, California; E. C. Glass, Superintendent of Schools, Lynchburg, Virginia; R. W. Goddard, Department Head, Physics and Electrical Engineering Department, New Mexico College of Agriculture and Mechanic Arts; C. A. Grommet, Principal, Modern Business College, Los Angeles, California; Ezra A. Healy, Dean, Maclay College of Theology, University of Southern California, Los Angeles, California; Howard Memorial Library, New Orleans, Louisiana; E. V. Huntington, Professor of Mechanics, Harvard University, Cambridge, Massachusetts; Thomas F. Kane, President, University of North Dakota, Grand Forks, N. D.; Vladimir Karapetoff, Professor of Electrical Engineering, Cornell University, Ithaca, New York; Roy W. Kelly, Director, Division of Education, Bureau of Vocational Guidance, Harvard University, Cambridge, Massachusetts; Charles F. Kent, Professor of Biblical Literature, Yale University, New Haven, Connecticut; J. T. Kingsbury, President Emeritus, University of Utah, Salt Lake, Utah; D. W. Kurtz, President, McPherson College, McPherson, Kansas; A. J. Ladd, Professor of Education, University

of North Dakota, Grand Forks, N. D.; Alexis F. Lange, Dean, School of Education, University of California, Berkeley; James Melvin Lee, Editor and now Director of the Department of Journalism, New York University; William E. Mott, Dean, School of Applied Science, Carnegie Institute of Technology, Pittsburgh, Pennsylvania; Harold Bender, Professor-in-Charge, Department of Electrical Engineering, University of Pennsylvania, Philadelphia, Pa.; H. B. Pulsifer, Professor of Metallurgy, Montana State School of Mines, Butte, Montana; G. Canby Robinson, Dean, Washington University, St. Louis, Missouri; Rock Island Board of Education, Rock Island, Illinois; J. C. Sathre, President, Crookston College, Crookston, Minnesota; F. E. Searle, Superintendent, Ford Schools, Ford Motor Company, Detroit, Michigan; Carl E. Seashore, Dean, Graduate College, State University of Iowa, Iowa City; Joseph A. Serena, President, William Woods College, Fulton, Missouri; J. Russell Smith, Professor of Industry, Wharton School of Finance and Commerce, University of Pennsylvania, Philadelphia, Pa.; W. I. Smith, President, Walla Walla College, College Place, Washington; H. D. Sparks, President of Sparks Business College and Conservatory, Shelbyville, Illinois; E. L. Stephens, President, Southwestern Louisiana Industrial Institute, Lafayette, Louisiana; Tampa Business College, Tampa, Florida, thru President L. M. Hatton and faculty; University of Georgia, Medical Department, Augusta, Georgia; University of Tennessee, College of Medicine, Memphis, Tennessee; Patterson Wardlaw, Dean, University of South Carolina, Columbia, S. C.; Washington Academy of Science, Washington, D. C.; West Virginia Wesleyan College; Whittier College faculty, Whittier, California; Charles B. Williams, President, Howard College, Birmingham, Alabama; Marshall F. Winne, President, University of Dallas, Dallas, Texas; R. H. Wilson, State Superintendent of Public Instruction, Oklahoma City, Oklahoma; Woman's Medical College of Pennsylvania, Philadelphia, Pa.; C. A. Wright, Professor, Department of Electrical Engineering, Ohio State University, Columbus, Ohio; Valparaiso Teachers' Institute, Valparaiso, Indiana; E. F. Warner, High School Inspector, State of Ohio, Department of Public Instruction; Howard Dwight Smith, Department of Architecture, Ohio State University, Columbus, Ohio; Frank Dean Tubbs, Professor of Astronomy and Geology, Bates College, Lewiston, Maine; Hamline University, Saint Paul, Minnesota (unanimously); Oswald Schlockow, Department of Education, City of New York; University of Minnesota Medical School, Minneapolis, Minn.; Women's College of Delaware, Newark, Delaware, thru Winifred J. Robinson, Dean; John M. Dodson, Dean of the Medical Courses, University of Chicago, Illinois; J. C. Nagle, Dean of Engineering, Agricultural and Mechanical College of Texas; R. L. Green, Department of Mathematics, Stanford University, Palo Alto, California; C. R. Bardeen, Dean of the Medical School, University of Wisconsin, Madison, Wisconsin; Dean G. G. Pond, Pennsylvania State College; Charles F. Lanman, expert on Oriental Languages, Harvard University; Rusk Junior College, Rusk, Texas, thru M. W. Robinson, Dean; Bruce Bartholomew, Berkeley High School, Berkeley, California; A. J. Eddy, Department of Civil Engineering, University of California, Berkeley, California; Harriett Bradford, Dean of Women, Stanford University, Palo Alto, California; P. A. Martin, Department of History, Stanford University, Palo Alto, California; Lewis E. Johnson, Department of Civil Engineering, Harvard University, Cambridge, Massachusetts; H. P. Talbot, Department of Chem-

istry, Massachusetts Institute of Technology, Cambridge, Massachusetts; Delos Fall, Dean of Albion College, Albion, Michigan; Maxwell Adams, Dean, College of Arts and Science, University of Nevada, Reno; Arthur G. Fletcher, Proctor Academy, Andover, New Hampshire; Richard D. Currier, President, New Jersey Law School, Newark, N. J.; Dr. Henry L. Taylor, Board of Education, New York State, and hundreds of thousands of others.

AUTHORS, ARTISTS, EDITORS, PUBLICISTS

H. L. West, Editor, "The Bookman": "I am with you heart and soul in trying to do away with our present absurd system of measurements."

C. W. E. Miller, Editor, "American Journal of Philology," Baltimore, Maryland: "The adoption of the Metric Standards Bill would be an immense step forward educationally, politically, socially and commercially."

Charles Edward Russell, journalist and author, Washington, D. C.: "I am in favor of the metric system and should like to see it adopted by the United States."

Margaret Deland, noted author; Kennebunkport, Maine: "The world standardization of weights and measures, thru the adoption of metric units by America and Britannia would go far towards stabilizing the peace of the world, because it would contribute to a commercial understanding which our differing standards of weights and measures has heretofore made impossible."

John Spargo, noted author and lecturer; Old Bennington, Vermont: "I have no hesitation in saying that I believe the adoption of your proposal would tend to make international intercourse more easy and more efficient than it is now. As a general proposition, uniform methods of trade communication are helpful in promoting international understanding. Certainly our own weights and measures are very antiquated and the British very much worse."

Bliss Perry, author, and Professor of English at Harvard University: "The arguments for adopting the metric system are **unanswerable.** The obstacle is simply the traditionalism, complacency and inertia of our fine old crusted Anglo-Saxon habits. Every consideration of **scientific efficiency** and commercial progress is in favor of a world system of measurement."

G. O. Oakes, Editor, Current History Magazine of the "New York Times": "Personally the writer warmly favors the metric system."

Henry Smith Williams, noted Scientist and Contributing Editor; New York City (3 February, 1921): "I am glad to cooperate in any way possible."

Dr. Frank Crane, the noted journalist and editorial writer for the Associated Newspapers which reach more than 10,000,000 people: "We have international systems of time, longitude and the like. The metric system of weights and measures is the only system adapted to world use, and has already been almost universally adopted. Why do we not take it up? The chief advantage is that it has the decimal ratio. By it a child can learn to measure wheat or water or land or distance as easily as he now learns to count money. We need to agitate public sentiment until Congress inaugurates its nation-wide adoption."

Arthur Brisbane, distinguished editorial writer; editor, "Chicago Herald and Examiner": "It would be perfectly simple to put into effect the metric system, which would make it possible to multiply and divide bushels, quarts, pecks, ounces, grams, and pounds, by striking off or adding a zero, just as you now multiply or divide sums of money."

Herbert Adams Gibbons, famous War Correspondent, Lecturer and Author; writing in the "Philadelphia Press": "Very soon we are coming to the realization of the handicap of the British system when we go in for world trade. The handicap may well prove fatal to us. It is time now that Chambers of Commerce and all who are interested in foreign trade join in the demand for abandoning the British standards of weights and measures in favor of the world-wide meter-liter-gram. For the sake of keeping pints and quarts and gallons, inches and feet and yards, ounces and pounds and tons, Americans lose a lot of time each year in calculations that are wholly unnecessary, when they might be simply moving the decimal point. Among the names of advocates of the meter-liter-gram, we see Alexander Graham Bell, Lord Kelvin, Samuel Vauclain, Theodore Roosevelt, Thomas A. Edison, Luther Burbank, Henry Ford, General Pershing and virtually all the great manufacturing concerns of the country."

Writing from his home in Princeton, New Jersey, Herbert Adams Gibbons says: "As to the importance of changing our stupid system of weights and measures, I could give numerous instances of trade lost by Great Britain and the United States by our lack of a uniform system with the rest of the world. Who works for the abandonment of our present system of measures works for world peace, and also for the advancement of American commerce and American culture thruout the world."

Floyd Gibbons, noted War Correspondent for "Chicago Tribune," Paris, France (2 February, 1920): "The reason why the United States doesn't change to counting in pence, shillings,

and pounds is the same reason the United States should have the full metric system."

Sherwin Cody, noted Author of Personal Development Service, "Forbes Magazine;" Managing Director, Business Standards Association, New York City (26 February, 1920): "There is no question that the metric system is a great time-saver, and is well on the way to becoming the world standard."

Frederic J. Haskin, Director, "The Haskin Letter," Washington, D. C., in article, "The Needed Meter": "If you do not understand the metric system of measurement, **look it up** and learn it. For there are strong indications that the meter and liter and gram will soon displace the yard and quart and pound in all your dealings."

George F. Weeks, Editor, "The Mexican Review," Washington, D. C. (16 September, 1921): "Having lived in Mexico some 15 years, I am a believer in the metric system."

Among the many authors, artists, editors and publicists who are urging the decimal metric units may be mentioned: Henry Van Dyke (quoted elsewhere; see Index); Franklin W. Calkins, author (one of chief contributors to "The Youth's Companion") Aladdin, Wyoming; Grace Ellery Channing, author, New York City; Edmund Vance Cooke, noted contributor to the leading periodicals, Cleveland, Ohio; Herbert Coolidge, author, Santa Barbara, California; Herbert S. Houston, Vice-President, Doubleday, Page & Co., and President, Associated Advertising Clubs of the World, 1915, 1917; Sterling Heilig, Paris, noted war correspondent; E. B. Filsinger, New York City, world trade contributor to Technical Journals; William Howard Gardiner, New York City, eminent author on Pacific Problems; George Wharton James, Pasadena, California, noted author, explorer and ethnologist; W. R. Harris, Editor, "Highway Engineer and Contractor," "Concrete Products," also Associate Editor, "Engineering World"; Reginald Wright Kauffman, novelist, war correspondent, Columbia, Pennsylvania; George Whitefield D'Vys, author, Rowe, Massachusetts; Charles Johnson Post, journalist, artist and editorial writer with the Associated Press and many leading periodicals, New York City; Julian Ralph, much-read American author; Cuyler Reynolds, Albany, New York; Marshall Saunders, Greenfield, Ohio, author of "animal stories"; H. H. Windsor, editor and publisher, "Popular Mechanics Magazine," Chicago, Illinois; Henry Beets, author and editor, "The Banner," Grand Rapids, Michigan; William Henry Bishop, author, Brooklyn, Connecticut; Gardner Hunting, author and production editor, Famous Players Studio, New York City; Percy Ives, eminent artist, Detroit, Michigan; Robert Vonnoh, eminent painter, New York City; Charles Rohlfs, designer, Buffalo, New York; Albert Jaegers, eminent sculptor, Suffern, New York; Francis Edwin Elwell, eminent sculptor, Weehawken, New Jersey; V. Stefansson, noted Arctic Explorer and author, New York City; Gordon Strong, Chicago, Illinois; Allen Brett, Editor, "Better Business," Cleveland, Ohio.

PUBLICATIONS, PERIODICALS, NEWSPAPERS

Thousands of publications thruout the United States of America are participating in the discussion of the world metric standardization movement. The World Metric Standardization Council has in its files at least 10,000 clippings from newspapers and periodicals, from which the following selection is made:

New York "Sun" (7 May, 1919): "The world is in a frame of mind for such unifications and standardizations. Moreover, the great international trade of the future is entitled to the simplest, most economical processes."

"Daily Herald," New York and Paris, in a metric campaign (1905-6) published daily columns of interviews. Thousands advocated exclusive use of meter-liter-gram. "All trades and industries would be benefited by the adoption of this standard which is uniform, accurate, and easily understood, adapted to every practical use, and known and accepted thruout the civilized world."

"Public Ledger," Philadelphia, Pa. (23 March, 1921); "Men and Business," by Richard Spillane: "Mark Twain once remarked that everybody complains about the weather but nobody does anything. Everybody who has anything to do with 3 of the great departments of international affairs —money, weights and measures, and languages—complains about the confusion and waste attending them, but nobody does anything to correct them, except at rare intervals, such as that started a few years ago in regard to making the metric system universal."

"Evening Mail," New York, N. Y. (30 January, 1918): "We are adopting the metric system piece-meal. We did a good thing for ourselves when we applied the decimal system, a phase of the metric system, to our currency. Any proposal to reject that system now and revert to the anarchic arbitrary method of computing money would be laughed to scorn.

"But, with a backwardness which is wholly at variance with American traditions in almost every other respect, we cling to the old, inconvenient, unreasonable and utterly inexcusable measures of weight, distance and volume. And now we have made a concession to the modern spirit under the stress of war. The War Department has adopted the metric system of measurements for artillery, machine guns and maps for the American oversea forces, because it was asked by the French government to eliminate the danger of confusion in our co-operation with France, which uses the metric system thruout.

"The request of the French government has battered down one of the walls which we have built around our arbitrary and antiquated system of measurement, and which we have stoutly defended against all the world. Let us take up the excellent work which our ally and historic friend has so auspiciously begun. Let us throw out and promptly forget every ounce, pound, ton, pint, quart, gallon, inch, foot, and mile we ever knew, and let us adopt the most logical, the most perfect, the most convenient and the most reasonable system of measurements in the world—a reckoning based upon the numerical system itself."

"Examiner," Los Angeles, California (7 August, 1919): "There are many grave matters of preparation that are being neglected. One of the most important of these is the necessity at once to free our commerce from the

handcuffs of a mediaeval terminology by adopting the metric system of weights and measures.

"All of the countries with which we hope to develop a commerce, easily within our grasp if we treat the problem with sense and science, use the metric system, with a single exception of the British Empire. That power, like our own, sticks to its own old provincial system, which by no means is identical with the equally archaic American.

"In his first message to Congress, President George Washington urged the adoption of the metric system. It is not yet too late to accept his advice. Only we should be foolish to wait any longer. The metric system was a prime factor in giving Germany the cream of Latin-American trade, because Latin-America is 100 per cent metric, and does not understand any other system of weights and measures."

"Tribune," Chicago, Ill. (27 June, 1919): "Our present system of weights and measures has no support except tradition. It is a tradition inherited from our English ancestors, but every American scientist prefers the metric system and, as a matter of fact, no other system is used for scientific work. Our currency is founded on the metric principle, and its convenience is obvious to every one. We probably do not realize how much time and trouble is involved in using our present standards of length and mass.

"There is, however, a more immediate reason why we should adopt the metric system. Every South American country now uses this method of designating weights and measures, and for this reason they find it easier to trade with European countries, where the metric system was long since adopted. If we want to develop trade with South American nations, we shall find it is of the greatest advantage to make our system conform to theirs." The Chicago "Tribune," on 13 July, 1919, said: "A correspondent urges the adoption of the metric system. We are for it."

"Middletown Journal," Middletown, Ohio (30 July, 1919): "The World Trade Club has started the ball rolling in the right direction. What we all need is to familiarize ourselves with the proposed system. A thoro knowledge of it will dispel all opposition to it."

"The Argonaut," San Francisco, California, has petitioned the legislators of the United States of America and the British Commonwealths for exclusive use of the meter-liter-gram.

"Evening Transcript," Boston, Massachusetts, thru J. E. Chamberlain: "The 'Transcript' is advocating the metric system."

"Times," Los Angeles, California (5 March, 1920): "The transition from former systems of calculation to the simpler forms of the meter, liter and gram was made in the various countries adopting it without serious difficulty or delay. The system once adopted here would prove as simple and as workable as our decimal currency."

"News-Tribune," Detroit, Michigan (6 February, 1920): "Favorable action by this country would place our people in commercial harmony with a world of opportunity. We ought to get upon the wagon of progress."

"Christian Science Monitor," Boston, Mass.: "The question of weights and measures is preeminently a subject which cannot and ought not to be treated lightly. It is fairly safe to say that no one, unless he has some specific reason for securing the information, has any idea of the enormousness of the Anglo-Saxon system of measurements, in every sense of that word.

"The foot-pound-second advocate makes a great show of simplicity. Weights and measures are as simple to him as ever education was to the advocate of the three 'R's'. But behind the foot-pound-second, there are the many complications which he never mentions, apothecaries' weight, apothecaries' fluid measure, diamond and pearl weight, to say nothing of no fewer than 49 other 'miscellaneous' weights and measures."

"Odessa Herald," Odessa, Texas (2 August, 1919): "Once Watt's simple system is officially adopted, the change in the formula of our arithmetics will be so radical that mathematics will cease to be the holy terror that it is now to the average pupil, and become a favorite study."

"Republican," Midland, Mich. (28 August, 1919): "Why not have a decimal system of weights, measures and the whole business as well as in money—one principal unit of each sort, then a period (.) and the subdivisions in order of tenths following? Addition, subtraction, multiplication, and division would then be just as simple as in case of money amounts."

"Tribune," Sioux City, Iowa, thru John C. Kelly, Manager: "There can be no doubt that a universal standard of measurements would promote commerce and advance civilization."

"Scientific American," New York City (17 September, 1921): "Metric weights, now obligatory on Chinese railways, are said to have given rise to no trouble or complaint. The metric system went into force in Malta on July 1st. A chart issued by the Decimal Association shows consistent gains for the system during the past 100 years, with a particularly sharp rise to popularity in the last 10 years."

"Commerce and Finance," New York City (21 September, 1921): "The Metric Association was there (at the Chemical Exposition) showing us the silly waste of human energy and the confusion resulting from our antediluvian weights and measures which give pupils in our public schools brain fag before their time."

"Times," Washington, D. C.: "There is positively no doubt that the metric system is far more rational and more convenient than the system we now employ. The practical benefits of the metric system to us would be a great saving of time in memorizing tables and in calculating weights and measures; the use of a system inter-related, and the adoption by this country of an international system." On 25 April, 1920, the Washington **"Times"** said: "It seems impossible for us to realize the stupidity of the Chinese sticking to their preposterous alphabet, until we happen to remember that we hang on to our idiotic system of weights and measures instead of adopting the decimal system. That helps us to remain modest."

"Times-Union," Rochester, New York (28 October, 1921): "The installation of the metric system would cause confusion for a time but ultimately it would be of great benefit and save endless toil. **By all means let us have it."**

"Hearst's Magazine," September, 1919. **Common-Sense Measurements:** "When an American pays his first visit to England, he is sure to come away with very pronounced ideas as to the absurd monetary system there in vogue. **The use of so cumbersome a system as pounds, shillings, and pence strikes him as inherently absurd.** He hears it related that 2 or 3 bookkeepers are required in an English business house to do the work accomplished by one in America, owing to the difficulties of computing percentages according to this cumbersome system. And yet when the same Ameri-

© WILLIAM G. McADOO

© OTTO H. KAHN

© HARVEY W. WILEY

© SAMUEL GOMPERS

© WILLIAM B. WILSON

© JOHN LIND

© F. H. LA GUARDIA

DAVID PRESCOTT BARROWS

© FRANK L. POLK

© THOMAS A. EDISON

© BENEDICT CROWELL

© DAVID STARR JORDAN

Eminent Metric Urgers

McAdoo, Kahn, Wilson, Polk and Edison photos © by Underwood & Underwood; Wiley, Lind and Crowell photos © by "International;" Gompers photo © by Clinedinst, Washington, D. C.; LaGuardia photo © by Bain News Service; Jordan photo © by Hartsook.

LORD KELVIN

SIR VINCENT CAILLARD

SIR HIRAM MAXIM

© THEODORE N. VAIL

© GEORGE W. PERKINS

© J. W. ALEXANDER

©THEODORE ROOSEVELT

© CHAMP CLARK

© LEONARD WOOD

©JOHN HAYS HAMMOND

© HENRY FORD

©NICHOLAS MURRAY BUTLER

PRACTICAL MEN WHO HAVE URGED METER-LITER-GRAM

Hammond, Perkins and Butler photos © by "International;" Roosevelt and Wood photos © by Underwood & Underwood; Clark and Ford photos © by Hartsook; Vail photo © by Western Newspaper Union; Alexander photo © by Harris & Ewing, Washington, D. C.

can goes over to the Continent and attempts to do a little shopping, he is as much annoyed by the meters, liters, and grams of the tradesmen as he was by the pounds, shillings, and pence of the British; and he wonders why the Continental cannot deal in simple units like yards, pints, and pounds.

"All of which indicates the power of preconception. For of course the meter-liter-gram system is a decimal system, having all the advantages over the antiquated system of yards, pints, and pounds that the system of dollars and cents has over the cumbersome coinage of England. It chances merely that Continental Europe (and practically all other parts of the world except England and the United States) long ago adopted the plan of making a logical application of the decimal system all along the line; whereas we have agreed with our British cousins in refusing to accept the simple and effective system, holding obstinately to our antiquated methods in favor of which nothing whatever can be urged except the fact that we are accustomed to them."

"Popular Magazine": "We are rooters for the metric system, and so we were glad to see that the World Trade Club of San Francisco has inaugurated a vigorous campaign to have it adopted by the United States. Our present weights and measures are a relic of the medieval Hanseatic League. James Watt invented the metric system, but the Anglo-Saxon race from which he sprung is the last to adopt its own genius in this important matter. Like ourselves, Great Britain still clings to the unscientific old Hanseatic plan."

"The Christian Register," Boston, Mass. (7 August, 1919): "The World Trade Club of San Francisco, Calif., deserves credit for its far-reaching campaign to induce America and England to adopt the metric system. Britain still retains a very primitive method for the reckoning of money values. The United States has adopted the metric system for money, and any one who has experience in both countries knows with how much more facility change can be reckoned by the United States system. Both the United States and Great Britain, however, still adhere to the very ancient system forced upon England many years ago by the German Hanseatic Trading League. The new demands of peace should insistently urge us to the adoption of the sensible metric system. It already has been adopted in medicine, pharmacy, optometry, photography, physics, chemistry, astronomy, electricity, and aviation."

"Rough Notes," Indianapolis, Ind. (7 August, 1919): "The agitation in favor of the metric system in the United States deserves support and encouragement. **The war showed England and the United States the real danger involved in having standards of measurement which varied so greatly that it was practically impossible for the 2 nations to harmonize their war activities along mechanical lines.** For years the bunglesomeness of our standards of measure, aside from currency, have been recognized by the people of the United States. Now that we are facing a new era of international development in our business relations with other countries, it would seem hardly possible that we could make much progress without changing our national standards of measurements to the metric system which is that of the majority of nations with which we will have dealings. Now is the time for making such a change, it would seem, and **Insurance** interests, which are beginning to look beyond the borders of our own land for future development, would do well to lend the weight of their organized

influence to the end of better equipping ourselves for the new commercial conquests which we contemplate."

"Chamber of Commerce and Board of Trade Journal," Scranton, Pa., August, 1920. Saving The Nation's Cerebration: "Who will ever calculate in life-lengths the time wasted in the highest paid branch of engineering by the use of utterly unnecessary processes of multiplication and division, with an infinity of factors, and the checking and correcting of errors?

"Our brutally arbitrary standards of feet and inches having no basic relation to our gallons and pounds, what a complex process it is to reduce cubic feet to gallons or pounds? Our foot is supposed to be the length of an English king's foot, altho there were some kings more generously endowed than others with both feet and understanding. The gallon and the pound have not even this poor basis to build upon.

"How different it is with the metric system in which there is nothing arbitrary and no 2 things unrelated! The meter, the one 10-millionth part of the quadrant of the Paris meridian, is directly related to the liter, the standard of capacity, which is a cubic decimeter, and the gram, the weight of a cubic centimeter of water at 4 degrees centigrade. How different are the meter, the liter and the gram when compared with our foot, gallon and pound! How easy it is to reduce meters to liters and grams as compared with the kill-brain process of converting feet into terms of gallons and pounds!

"How much more difficult it is to multiply or divide by 62-1/2, 268.8, 537.6, 2150.42 or 1.244, when we wish to reduce a given quantity into pounds, pecks, bushels, gallons, inches or feet, than the mere changing of the position of a decimal point!

"How few can tell off-hand how many cubic feet or inches in a peck, a bushel, or how many pounds in a cubic foot of water? How many college graduates can tell you? Recently when an engineer testified in court that a cubic foot of anthracite weighed fifty-four pounds not a single judge or lawyer questioned the accuracy of the statement until a miner in the audience said in a stage whisper: 'He's thinkin' av Ivory Soap!' Yet a French school boy will convert liters and decimeters into grams at your will. **Oh, the brutal waste of the life of holy childhood in learning these endless tables designed by madmen dead and damned!**

"Let us have the rational metric system, which is as far ahead of our fogy measures as the harvester is beyond the sickle, or the electric motor is in advance of the ox. Why should we lag behind the Latins under the coercion of custom and the ghosts of other days?"

"Entomological News," Philadelphia, Pa. (June, 1919): **A League of Nations Means the Metric Units.** "A few years ago we published an editorial in the **News** endorsing efforts made in the House of Representatives to enforce the use of the Centigrade thermometric scale in United States Government publications. The strongest argument for such action was that the Centigrade scale was already in well nigh universal use.

"The progressive World Trade Club of San Francisco is urging the United States (the only large nation not using the Meter-Liter-Gram system) to take advantage of the present opportunity in the world's history and legalize the exclusive use of the metric system of weights and measures. The same reason for this change exists as is the case in the matter of thermometry.

"As entomologists we have been giving the size of insects in millimeters for many years, and when we go back to some old description and have to translate 'lines', or some other antique unit, into modern equivalents, we feel a sinking of the heart. Let us, in these days of a League of Nations, internationalize our standards of measurement as well as our political relations. Let everyone urge his Congressmen to do their utmost to accomplish this result."

"The Steward" (Bulletin of the Stewards' Association, New York), October, 1919: "In an editorial in our July issue we told of the campaign which the World Trade Club of San Francisco is conducting in favor of metric units, meter-liter-gram. The Stewards' Association of New York City has endorsed the project in open meeting and has forwarded petitions asking for legislation that will bring about the exclusive use of meter-liter-gram, by the United States of America, as well as England."

T. E. Willson, Editor, **"The Jewelers' Circular"** (20 December, 1919): "After the decimal carat, with a basis of 200 milligrams, was adopted by the jewelers' trade there was hardly a man, old or young, who would have considered for a minute the question of going back to the old carat, and its divisions of half, quarter, thirty-seconds, and so on. The rapidity with which the old system went out was really astounding."

"Popular Mechanics," Chicago, Illinois (August, 1919): "To change any custom which has had universal use in a country for centuries seems revolutionary, and suggests all sorts of difficult problems. We like our inches and feet just as the native in some lands today likes his antiquated wooden plow which has the sentiment of centuries of use. In some of our older cities, certain streets wind about, resulting in buildings of irregular and undesirable shapes, because years ago a cow path followed the direction of least resistance. Some of these freak streets have already been corrected, and no new ones are laid out so. Our present system has no better excuse for being continued, and should be changed. **Any person of ordinary intelligence can learn the metric system in an hour,** and school children will master it in a fraction of the time now required to learn the present tables."

"Tobacco," New York (28 August, 1919): "The World Trade Club, particularly, has been right on the job. Copious literature issued by the club has shown with relentless logic the need for world-standardization of weights and measures, and the gain the metric system would bring to the United States in trade, in manufacture, in education.

"Now is the time to remedy the error. The world-war showed us that all the world except the English-speaking peoples depended upon the simple, logical and efficient metric unit standardization. The United States and Britannia could not co-operate effectively with their allies until they had adopted metric standardization for war purposes.

"Write today. A postal will do it. Write your Senators, your Congressman. Get the thing done."

"Dry Goods Economist," New York City (24 May, 1919): "As far back as the early 90's of the last century the **Dry Goods Economist** printed a series of articles **showing why the change was advisable for the United States.** And if such a change was advisable a quarter of a century ago, it **surely is essential in these days, when the world has shrunk, when our relations with other nations have broadened and when our opportunities for foreign trade are greater than they ever were before."**

"The Inspector" (Official organ **American Society of Mechanical Inspectors**). Editorial by **Henry F. Winter** (15 September, 1919): "NOW is the most opportune time to adopt the Metric System.

"Standardization cannot be complete under the present English System. The only argument against the Metric System that possesses any logic, is the fact of the losses to be faced in the changing of equipment. These losses must be faced sooner or later, and the said losses multiply while we dilly-dally with technicalities.

"I truly believe that if the late Theodore Roosevelt had been in power during the past war the Metric System would today be a reality.

"National Security demands the Metric System.

"Industrial Supremacy demands the Metric System.

"Common Sense demands the Metric System.

"Now is the last real psychological and economic era in which to establish for once and for all this System of such momentous necessity to the Nation individually and collectively. No more debative delinquency can be tolerated. It must be now or never. Every Manufacturer must focus his attention beyond what present losses would be sustained. If not from a patriotic standpoint, then surely from the most mercenary deduction we must visualize the future. And no thinking man can dare oppose for a single moment the inevitable.

"If a few leading Manufacturers would publicly announce their intentions to adopt the Metric System at a predetermined date in co-operation with Governmental aid and also with the co-operation of the various Engineering Societies, everybody would fall into line. What is needed is but a real leader; an aggressive, progressive, constructionist with proper organization behind him to compel National action. The time for reviewing technicalities has passed. We have argued pro and con for years with the results that the Metric System has been unalterably proven and endorsed universally.

"Nothing short of action is now in order. Conservative but aggressive action."

"International Cinema Trade Review," article by **M. H. Shoenbaum** (June, 1919): "Are you an exhibitor somewhere in India, Africa, Siberia, London, Paris or New York? Or are you an exchange man? Perhaps your business is to buy films for other people, or do you prefer to earn your livelihood by producing film or machinery and equipment? Whoever you are and whatever you do, you are losing a certain amount of money every year, either in cash or in time, and the only excuse you have is that you don't know it!

"Have you ever tried to translate dollars into francs, or francs into pounds sterling, shillings, pennies and farthings? Have you ever attempted to figure out how much you would have paid for your shipment had the bill of lading been based on cubic feet instead of cubic meters? How many precious hours of your life have you spent calculating the cost of so many reels of films measuring each 300, 280, 275 and so forth meters into so many linear feet? Do you get much joy out of adding or subtracting 32nds and 64ths or changing 8ths into 16ths to render a solution possible? How about wire gage standards: Stubbs steel wire, Birmingham iron wire, United States Standards, Brown Sharpe, Washburn, etc.?

"How about screws? There are the Whitworth pitch, the U. S. Standard, the bicycle screw, the metric, the International, etc. Leaving aside purely technical matters, don't you think that calculations based on the yard, foot, inch, gallon, quart, and their fractions take too many of our busy moments? America and England, a giant republic and a giant empire, are voluntarily remaining behind the rest of the world when it comes to measures and weights. They persist in using a system, or **rather a plurality** of systems, which, when put side by side with the decimal system, look like the Chinese writing or printing compared to those of the Western World. There is no end to confusion, if neglected. **The only remedy to weights and measures confusion is the decimal method of counting**; it is the most simple because it does away with the necessity of fractional form."

"World Trade," San Francisco, California; Editorial Essay by **N. A. Davis**, Publisher (2 January, 1922): "In all seriousness, the present 'system' of weights and measures is a lovely crazy-quilt. But then, you see, some folks tell you, it would throw us into 'confusion' if all this wild nightmare of confusion were reduced to simple series of tens, so related that money count, and length, quantity and weight measures could be reduced to a common factor. Many of the old-school men who cling to time-honored conventions in weights and measures, fear change. The meter-liter-gram advocates sympathize with those good folks, and, as a matter of fact, propose to be as considerate of them as missionaries are said to be of a polygamous negro chief when converted to Christianity. The practice, we are informed, is not to force the chief to bring in a nice new one and throw out the old hags, but to maintain the crowd and marry no new ones. As a result no one is hurt and very soon polygamy is displaced by the more modern system. So we say, let those who are wedded to their medley measure methods keep their old hodge-podge. But let us have no new institutions handicapped in this way. And let us, after a transition period of 10 years, universally describe things in the world metric language, understood everywhere. The metric system is inevitable. The sooner we have it the better."

"World Salesman," a monthly journal of international trade, thru Roderic Penfield, American representative: "The World Salesman has been advocating metric standardization for some time. We are thoroly in agreement on the matter of standardizing a system of weights and measures thruout the world, and in fact believe that the standardization of many things in universal use would be of the greatest advantage."

"Tech Engineering News," published by the Alumni and undergraduates of the Massachusetts Institute of Technology, Cambridge, Massachusetts (November, 1921): "The metric weights and measures constitute a scientific system; our system is a **disorganization.** It is now generally admitted by the majority of intelligent persons in this country that the metric system is a much simpler and better system than that based on the customary Anglo-American standards. The metric system is an international system in the sense that it is employed in all accurate scientific work, in America as elsewhere, and also that it is in use in everyday life in all civilized countries excepting America, Great Britain and its colonies.

"The first step should be to bring commercial organizations of this country to a realization of the fact that our present system of standards is injurious to our foreign trade. The importance of the use of the metric system not only in foreign commerce but also at home is becoming recog-

nized. It is necessary to us because a large part of the world with which we carry on commerce has adopted it. Commercial organizations must be brought to realize that the present system is very wasteful of our most precious commodity—time. The saving of time brought on by the use of the metric system would repay the annoyance brought on by the change.

"We have observed the fact that a change to the metric system is needed for the sake of foreign commerce. We are encouraged by the fact that several large chemical concerns are now using this system as a business basis. In addition we now see that we need it also in general commercial and manufacturing transactions. If we are to have the efficiency so insistently demanded by the age in which we live, then we must have the metric system in use for the ordinary affairs of daily life of the mass of the people, we must have it in education, and we must have it in commercial and manufacturing industries. If efficiency is to be the slogan of this country, then the metric system must come, no matter what obstacles stand in its way."

Among the periodicals and newspapers which have published editorials or articles urging metric standardization are: American Grocer, New York City; American Zinc and Lead Journal, Joplin, Missouri; Amerika Esperantisto, official organ of the Esperanto Association of North America; The Casket, New York City; Democrat, Wichita, Kansas; Courier-Citizen, Lowell, Massachusetts; Educational Review, New York City; Farm and Dairy, Salem, Ohio; Hardware Review, New York City; Gazette, Berkeley, California; Harlem Magazine, New York City; Hudson Dispatch, Union, New Jersey; Journal of Electricity, San Francisco, California; New Jersey Law Journal; Northwest Medicine; Oil, Paint and Drug Reporter, New York City; "Pacific Ports," Seattle and Los Angeles; The Polytechnic, Troy, New York; The Popular Engineer, Bernharts, Pa.; Pacific Poultryman, Seattle, Washington (P. W. Harries, Editor and Publisher); International Shipping Digest, San Francisco and New York; Quakertown (Pa.) Free Press; Spokesman-Review, Spokane, Washington; Tennesseean, Nashville, Tenn.; Tucson Post, Tucson, Ariz.; Valve World, Chicago, Illinois; The Watchword, Dayton, Ohio; Successful Banking, Benton Harbor, Michigan; The Packer (see Chapter 10); numerous Agricultural journals listed elsewhere in the present chapter; and thousands of others.

OFFICIALS AND LEGISLATIVE BODIES

Thruout the United States of America thousands of Officials and others in the public service have urged gradual metric standardization. Typical of the action of legislative bodies is the resolution of the State Senate of Illinois, printed on page 159 of this book. Similar resolutions have been passed by the State Legislatures of California, North Dakota, Tennessee, Utah and other States; and the reader is referred to the Congressional Record and the official records of Metric Hearings in Congress, where they are printed in full. The Chicago City Council on 26 May, 1920, passed a resolution unanimously calling upon Congress to enact metric standards legislation. The vote was 66 to 0. (This important document

is reprinted in the 1921 record of the Senate hearings on the Ladd Metric Standards Bill.)

In the section on "Pre-Eminent Americans" there are presented the opinions of Cabinet officials in favor of the metric advance. Several statements by United States Senators and Representatives are also given; but more are not here printed because their publication subjects their authors to **persecution** from anti-metric propagandists. Nevertheless, it may be stated that scores of national legislators have given definite assurance to the World Metric Standardization Council that they intend to vote for the metric standards bill when it comes up for a vote in Congress. Some of the typical statements by other officials are here given:

Hugh M. Davis, Governor of Georgia (1 February, 1921): "I favor metric standardization."

J. A. O. Preus, Governor of Minnesota, St. Paul, Minnesota: "The advantages of the metric system over the present system of weights and measures are innumerable."

Albert F. Brown, Governor of New Hampshire, Concord, New Hampshire (2 February, 1921): "I have been convinced for a long time of the desirability of such standardization, and your efforts for securing it have my approval."

C. J. McCarthy, Governor of Hawaii (1 February, 1921): "I am very much in favor of this system."

Leonard Wood, Governor-General of the Philippines: "I know and favor the metric system."

P. P. Baxter, President of the Senate, State of Maine (18 January, 1921): "In my opinion, the Metric System is, in all respects, superior to the present system and I should like to see the State of Maine take the lead in urging its adoption."

George Otis Smith, Director of the United States Geological Survey: "The Geological Survey is interested in seeing this most practical and advantageous system of units generally adopted."

Frank L. Polk, when Acting Secretary of State, United States of America (17 May, 1919): "The Department of State believes the adoption of the metric system should be a subject of serious consideration by all organizations interested in world trade."

J. W. Alexander, when United States Secretary of Commerce (1920): "It has seemed to me for years past that we should have a uniform standard of weights and measures, recognized and used by all nations and especially those having intimate commercial intercourse. In the recent world war all movements of troops were measured and expressed in terms of the metric system and it was with no little difficulty that the average reader translated them into miles, yards and inches, and I am in sympathy with

your efforts and favor the adoption of the metric system as a universal system."

A. S. Burleson, when United States Postmaster-General (1920): "The proposition for the United States and the British Empire to standardize on the metric system solely is, in my opinion, technically and scientifically sound, and, once accomplished, would universally serve public convenience."

W. B. Wilson, when United States Secretary of Labor (26 February, 1920): "With reference to the movement to secure for the United States of America the general use of the Metric Weights and Measures System, I have to say that I am in favor of the adoption of this system."

Newton D. Baker, when United States Secretary of War (10 February, 1920): "The advantages of such a system are numerous and weighty. I hope some practical way can be found to place the United States on the metric system because of the very great advantage to our international trade which would result from our falling in with the standards which are used and understood thruout the rest of the world."

William G. McAdoo, when United States Secretary of the Treasury: "A very important thing is the adoption of the metric system. It was the most unhappy event that the metric system was ever defeated when it came up here—a monumental mistake. If taken up seriously and applied intelligently we could get it transformed in a few years, and it would do more for the development of trade than anything ever yet attempted."

Fred A. Britten, United States Congressman from Illinois: "I regard the adoption of the metric system of weights and measures by the United States of America as of great importance. I have been greatly impressed with the simplicity and the extensive use of the metric system thruout the world, and am thoroly convinced that it would be best for the people of the United States. The metric system is already used more widely than any other system of weights and measures, and is the standard for science the world over. Its universal adoption is inevitable."

Alexander T. Connell, Mayor of Scranton, Pennsylvania: "It seems to me that the Meter-Liter-Gram system, being endorsed by such prominent business and professional men, should have easy sailing in Congress."

C. B. McBrayer, Mayor of Shelby, N. C. (22 November, 1919): "I wish to go on record as being strongly in favor of metric units and I shall gladly favor and endorse any legislation which will bring about the exclusive use of Meter-Liter-Gram by the United States of America."

C. C. Nelson, Mayor, Salt Lake City, Utah, (8 January, 1921): "The individual members of the Board of Commissioners personally favor the adoption of the metric system and feel that the provisions of the proposed law are such as to make the change without doing violence to any line of business."

Samuel C. Dunlap, when Commissioner of the Georgia State Bureau of Industries and Immigration: "A change in our system of weights and measures has been too long delayed. No greater step can be taken in the direction of commercial development."

Duncan U. Fletcher, United States Senator from Florida: "I think it would be advisable to have standardization of weights and measures. It would be well to adopt the principal units—Meter-Liter-Gram—at least they should be used in all foreign transactions."

Joseph Irwin France, United States Senator from Maryland: "I appreciate the importance of the subject of metric standardization of weights and measures to those engaged in foreign trade and the advantages which the metric system holds over the system now in use."

C. S. Thomas, when United States Senator from Colorado (15 September, 1919): "The standardization of weights and measures is too obviously necessary for comment."

William C. Lovering, when Representative in Congress from Massachusetts: "I favor the metric system because it is a system. The weights and measures which we now use are not a system. With the Government employing the metric system, after 2 or 3 years the country at large will have an object lesson in the benefits of a real system of weights and measures which will give great force to the movement for its adoption. The opposition, such as there is, to the metric system, comes from persons who have never studied it. I have never met a fair-minded man, if he was familiar with it, who declared himself against it." (Representative Lovering was extensively interested in cotton manufacturing.)

J. H. Southard, when Chairman of the Committee on Coinage, Weights and Measures, United States House of Representatives: "It is frequently charged by those opposed to the metric system that its advocates are dreamers and theorists. On the contrary, it is my experience that **those who are opposed to it are those who are unfair.** I have been a member of the Committee on Coinage, Weights and Measures for many years, and have thus come in contact with many who are for, as well as some who are against, the metric system. I have met with but one or two persons during this time who assumed to be familiar with both systems who were not unequivocally for the metric system. Practically all those who

have used both systems extensively give decided preference to the metric."

J. S. Edwards, Manager, Agricultural Section, Division of Traffic, United States Railroad Administration, Washington, D. C. (22 December, 1919): "My observation and experience is that the adoption of the metric system will be a good thing for the United States of America."

John Koren, Chairman, Department of Statistics, Boston, Massachusetts (14 May, 1919): "Of course, I am glad to help on this metric movement, as anyone who has given the subject thought must be."

John H. Sullivan, City Superintendent of Weights and Measures, Newark, New Jersey (14 March, 1920): "If the metric system is adopted the short-weight problem will be solved forever."

Philip Holland, American Consul, Basel, Switzerland: "I am one with all the other American consuls abroad that we should adopt the meter-liter-gram system."

B. Harvey Carroll, American Consul, Naples, Italy: "In more than a score of reports to the Department I have taken occasion to advocate the abolition of the imbecility of the English system of weights and measures and the adoption of the metric system." (These statements are typical of hundreds by commercial representatives of the United States of America abroad. See Chapter 14; also, consult Index.)

J. D. Long, Executive Officer, U. S. Bureau of Public Health Service, Washington, D. C. (4 August, 1921): "The Service, of course, uses the metric system on account of its standardized units and the greater convenience and accuracy obtained."

Royal Meeker, Commissioner of Labor Statistics, Washington, D. C.; Head of the Scientific Section, International Labor Office, Geneva, Switzerland: "The reason that in the past there has sometimes been a generation between the discovery of a scientific principle and its application to industry lies in the fact that scientific men and technologists have been living in different worlds. The use of science in industry depends largely upon the availability of the science, and this availability depends to a great extent upon the units of measure. It seems to me that the universal adoption of the metric system is inevitable and that this progressive step will be taken in the near future."

E. F. Hartley, Chief Statistician for Manufactures, U. S. Department of Commerce (6 March, 1920): "The metric system of weights and measures would be of very great value to this office in compiling statistics of manufactures."

Friend W. Richardson, Treasurer, State of California, Sacramento, Calif. (4 February, 1920): "By doing away with gallons and quarts and bushels and pecks and adopting the metric system, we learn to speak a world language. The argument for the metric system is irresistible. The fact that we have such ease with handling our money is proof of this."

C. R. Forbes, Director, Bureau of War Risk Insurance, United States Treasury Department, Washington, D. C. (15 July, 1921): "I am glad of the opportunity to add my indorsement to this movement for the metric system of weights and measures; and, being an engineer by profession, I have found that its systematic decimal relations greatly facilitate rapid and accurate mental as well as written calculations. For this reason, together with the fact that three-fourths of the nations of the world now use it almost exclusively, I venture the prediction that the achievement of your most sanguine expectations will be early realized."

John Lind, formerly Personal Representative of the President of the United States in Mexico; in "The Mexican People": "There are important steps which in my judgment are imperatively necessary to insure permanent success. We must get into line with the commercial world in the matter of weights and measures. I asked an intelligent German merchant in Vera Cruz one day to explain to me how it had come about that Germany had absorbed so much of the trade that at one time went to England. He reached into a drawer, pulled out an invoice from England and said, 'Do you see those denominations of yards, feet and inches, gallons and pints; pounds, 2 kinds of ounces, grains and pennyweights, the whole summed up in pounds, shillings and pence? Well,' he continued, 'a Mexican, even if he can read a little English, needs an interpreter and an accountant to put this into the language of civilization. And,' he added, 'their business methods generally are just as antiquated as their methods of computation. That is why we get the business and then we make, not what suits us, but what the trade wants.'

"I wish the recital of this little incident could make the impression on you that it did on me. If it did **you would petition the President to make an order requiring government business to be transacted on the metric system**—after 6 months such an order would accomplish the change. **We should be in accord not only with Latin America, but all the rest of civilization, except England.**

"The American manufacturer and merchant must learn to understand that a foreign market is always a 'buyers' market.' They have been accustomed to dealing in a seller's market here at home so long that it is hard for them to learn that lesson. England used

to have virtually a monopoly of modern industry. She still roosts on that memory—she still thinks the world has to come to her. That is why she is being distanced in the commercial race."

Among the national legislators and officials who have expressed themselves in favor of the world metric standards are such men as Arthur Capper, Theodore Roosevelt, Julius Kahn, Admiral W. S. Benson, A. D. Lasker, John Barton Payne, W. C. Redfield, E. T. Meredith, Henry Van Dyke, Franklin D. Roosevelt, Elihu Root, Champ Clark, Fiorello H. La Guardia, and many others whose statements will be found in this book. (Consult Index.)

A few of the other Officials who urge the metric advance are: D. E. Beardsley, Mayor, Dickson, Tennessee; F. N. Burrows, Mayor, Bathgate, North Dakota; John F. Dudgeon, Mayor, Norfolk, Nebraska; Fred E. Eldredge, Mayor, Panguitch, Utah; J. W. Ferle, Mayor, Lansing, Michigan; W. F. Freeman, Mayor, Ardmore, Oklahoma; Eugene Gallaway, Mayor, Coleman, Georgia; Samuel M. Hastings, Mayor, Highland Park, Illinois; J. J. Keegan, Mayor, City of Globe, Arizona; Frank G. McPherson, Mayor, Beaver Falls, Pennsylvania; Charles Morieux, Mayor, City of Calais, France; J. F. Osborne, Mayor, Joplin, Missouri; D. F. Powell, Mayor, Walla Walla, Washington; John R. Schisler, Mayor, Winthrop, Minnesota; William Sillboe, Turtle Lake, North Dakota; Perry D. Thompson, Mayor, Lowell, Massachusetts; H. S. Vincent, Mayor, Deadwood, South Dakota; James H. Williams, Mayor, Middleport, Ohio; S. T. Carson, Mayor, Bethel, North Carolina; D. F. Dunkle, Mayor, West Palm Beach, Florida; B. F. Genther, Mayor, Brookneal, Virginia; W. D. Johnson, Mayor, Milford Centre, Ohio; F. C. Jones, Mayor, Lewis, Iowa; James Rolph, Jr., Mayor, San Francisco, California; W. W. Seymour, Mayor, Tacoma, Washington; R. E. Stalcrys, Mayor, Dalhart, Texas; Al C. Anderson, State legislator, Wisconsin; James Allan, State legislator, Nebraska; Henry O. Andrew, State legislator, Boulder, Colorado; W. A. Ashbrook, State legislator, Ohio; Stephen J. Benner, State legislator, Ohio; Charles P. Caldwell, State legislator, New York; W. H. Chrisman, State legislator, New Mexico; J. M. Crawford, State legislator, Dundee, Oregon; B. G. Crisp, State legislator, North Carolina; Emma F. A. Drake, State legislator, New Plymouth, Idaho; C. R. Evans, State legislator, Nevada; Edward D. Helfrich, State legislator, Galion, Ohio; Charles A. Maxwell, for County Commissioners, Cumberland County, Maryland; William Mellen, State legislator, Cripple Creek, Colorado; Oscar A. Naplin, State legislator, Thief River Falls, Minnesota; Walter M. Pierce, State legislator, La Grande, Oregon; A. J. Pullen, State legislator, Madison, Wisconsin; Maurice P. Rice, State legislator, Lewistown, Illinois; Julius A. Schmahl, Secretary of State, St. Paul, Minnesota; James A. Wenstrom, State legislator, Dover, North Dakota; Charles S. Andrus, Chairman, Industrial Commission of Illinois, Chicago; Elias M. Ataviado, Provincial Secretary-Treasurer, Densalan, Philippine Islands; Andrew Baumert, Jr., Chairman, Commission of State Institutions, Phoenix, Arizona; E. F. Benson, Commissioner of Agriculture, Olympia, Washington; Jose Bermejo, Bureau of Customs, Manila, Philippine Islands; Borough Council, Shickshinny, Pennsylvania; C. A. Briggs, Bureau of Standards, Washington, D. C.; H. D. Brown, Chief, U. S. Bureau of Efficiency, Washington, D. C.;

Bureau of Standards, State of Oklahoma, Norman, Okla.; John C. Ferguson, Advisor to the President of China, Peking, China; Charles M. Fuller, Sealer of Weights and Measures, Los Angeles County, California; W. W. Gilroy, Deputy Commissioner of Labor Statistics, State of Wyoming, Cheyenne, Wyo.; W. A. Graham, Commissioner of Agriculture, State of North Carolina, Raleigh, N. C.; Joseph J. Hallowell, Commissioner, Mayor's Bureau of Weights and Measures, New York City; Jess C. Hover, City Clerk, Binghamton, N. Y.; Barton Mansfield, Insurance Commissioner, State of Connecticut; Lieutenant-Colonel C. J. Marshall, Secretary, State Department of Agriculture, Harrisburg, Pennsylvania; Jewell Mayes, Secretary, State Board of Agriculture, Jefferson City, Missouri; H. J. Patterson, D. Sc., Maryland Agricultural Experiment Station, College Park, Maryland; James J. Rafferty, Director, Bureau of Commerce and Industry, Manila, Philippine Islands; Nicholas Ricciardi, District Vocational Officer, Federal Board of Vocational Education, San Francisco, California; J. H. Roberts, formerly Superintendent U. S. Employment Service, Charleston, S. C.; H. D. Sammis, Secretary, Public Service Commission, Carson City, Nevada; R. J. Stegall, Clerk, County Court of Fayette County, Fayetteville, West Virginia; David O. Thomas, County Superintendent of Highways, St. Clair County, Belleville, Illinois; Theodore Townsend, Secretary, State Board of Accountancy, Milford, Delaware; Fred H. Waechter, Secretary, Borough of West Hazelton, Pennsylvania; Robert D. Wall, State Veterinarian, Des Moines, Iowa; Wesley Webb, Secretary, State Board of Agriculture, Dover, Delaware; William C. Wells, Chief Statistician, Pan-American Union; Dr. C. L. Woods, U. S. Indian Service, Valentine, Arizona; P. L. Wormeley, U. S. Department of Commerce, Washington, D. C.

The Weights and Measures Officials of the United States, in conference assembled at Washington, D. C., have endorsed the metric advance; and they have denounced statements of the anti-metric propagandists as "false, malicious and untrue."

TYPICAL WORLD OPINION ON METRIC STANDARDIZATION

J. Joffre, Marshal of France (23 April, 1920): "I very highly approve the initiative shown in trying to get the metric system adopted in English-speaking countries. It is certain that the simplification that would be brought to your system of weights and measures would be of great service from a scientific and commercial point of view. It would also be useful from the viewpoint of military terminology."

Henri Petain, Marshal of France (22 April, 1920): "I am confident that the adoption of the metric units will greatly facilitate the development of greater economic relations between allied countries."

R. Nivelle, General in the French Army (22 December, 1920): "I had the honor of replying to the same question which has just been asked me (as to the advantages of adopting the Metric system) when I was commanding the armies at Verdun. There is not a doubt that standard and unified measures would materially facilitate relations between the different nations. The Metric System—the most modern and scientific system by far—will prove itself more and more necessary as international relations become more general and more clearly defined. It is hardly necessary to take into consideration the small question of national pride, which is of so

little moment between Allies such as the 2 great republics of America and of France, which for 3 centuries have been bound by ties of friendship which nothing has ever weakened or will ever break."

Raymond Poincare, Premier of France; former President of France: "M. Poincare is convinced of the great advantages that the Metric System performs for the unification of measurements." (Aristide Briand, recent Premier of France; and Marshal Ferdinand Foch are both cited elsewhere in this volume. Georges Clemenceau has also commended the world metric movement.)

M. Gourdaine, Minister of Labor, Republic of France (24 April, 1920): "The active campaign with a view to obtaining the adoption of the metric system of weights and measures thruout the world has all my support."

Armando Diaz, Commander-in-Chief, Italian Forces in the World War (1922): "If the metric system were used universally, in like manner to an international language, it would certainly bring about a great simplification of commercial intercourse and in addition have a favorable influence in eventually removing the causes of strife among nations."

Alejandro M. Unsain, Vice-President of the Argentine Department of Labor; Advisor, Argentine Delegation, International Labor Conference (25 November, 1919): "The international metric system of weights and measures is the only legal system in Argentina. Metric weights and measures are used exclusively. No other system is tolerated within the republic."

Dr. G. Pardo, Delegate from Italy to the International Labor Conference, Washington, D. C. (25 November, 1919): "I sincerely hope that the United States Congress and the British Parliament will expedite legislation to secure for their respective countries the advantages of the general use of metric weights and measures. This would increase the efficiency of world labor and world trade, and would help the nations of the world to secure a common understanding."

Dr. Iwasaburo Nakahara, President of the Japan Electric Association (25 November, 1919): "The Japanese Army has used the metric system exclusively for over half a century. An official Commission consisting of representatives of the most prominent engineering societies of Japan recently made an extensive investigation with regard to the simplicity, adaptability and effectiveness of the metric system. It was **unanimously** decided that the international metric system would prove best for Japan."

"L'Independence Belge," Belgium (1921): "With all her supremacy in matters of industrial organization, the United States hesitates to adopt the metric system. Such argument (as is made by conservatives as excuse for retaining the cumbersome weights and measures) is astonishing coming as it does from men who have not been stopped by the greatest technical upheavals and who seem on the contrary to be most apt to adapt themselves to new things. But the fact remains, in this question of the metric system, and it is curious to note. It makes one think indeed that the people least attached to traditions—and who have also the fewest—still keep a certain fund of superstition, at least in certain domains. Can we be astonished then at the resistance of other peoples against certain progress whose value is obvious?"

The rapid trend toward metric standardization everywhere is indicated by excerpts from the world press:

JAPAN: "The Metric Bill, proclaimed by the Emperor on 12 April, 1921, stipulates that within the period of 3 to 5 years the metric system be

adopted by government offices, government works, most of the leading factories, technical schools and others. The period of 20 years to come is, however, allowed for the adoption by the general public, after which the use of the metric system will be made compulsory. The reform is a marked step toward internationalization of Japan's economic structure, and ranks in importance with the adoption of the Gregorian calendar at the beginning of the Meiji era. . . . Dr. Imaidzumi, of the House Committee on the bill, when he reported it to the House of Representatives on 25 March emphasized his belief that **the metric system will in no distant future be adopted by America and Great Britain,** the tendency toward which can be gaged by the recent resolution adopted by the League of Nations to recognize the Metric System Agreement made at Paris in 1876." (In "American Machinist," 10 November, 1921.)

RUSSIA: "An executive order directs that the metric system be officially used on and after 1 January, 1922." (Special despatch to New York World, 12 October, 1920.) "It is reported that the Russian Government has decided to introduce the metric system in August, 1921, and to prohibit the use of the old system of weights and measures from 1 January, 1925." ("Handbook of Siberia and Arctic Russia," p. 368; published by the British Admiralty.) "According to a decree of the People's Commissars published in official Soviet papers, the metric system of measure was to be introduced in all Soviet institutions beginning with January, 1922, and from 1924 the metric system of weights and measures must be finally and universally adopted thruout Soviet Russia." (In "New York Commercial," 9 January, 1922.)

NETHERLANDS AND COLONIES: "Progressive firms the world over who are doing an international business are agitating for a system of standardized and efficient weights and measures. The varied systems now in use are not only cumbersome, inefficient and troublesome, but conspicuous for the lack of logic displayed. The clerk hire, the misunderstandings and mistakes incurred in converting piculs to tons, liters to quarts, gallons and bushels, inches and feet to meters, etc., is useless, unnecessary and ridiculous. On the surface this may not appear to be of much serious consequence, but any one who has attempted to harmonize the finer measurements of nuts, bolts, screw threads and machine parts under the present system will soon realize the seriousness and inconvenience of our lack of international standards.

"The decimal coinage system has long since proved its superiority over the cumbersome pound, shilling and pence method which is so burdensome to countries doing business with England, but this is not nearly as ridiculous as some of the weights and measures which could be far more easily converted to the simple and sane **metric system.** International business, as it flows along in a steady stream, as a great river in a well defined course, is not easily changed or dammed long enough to make even the slightest change. However, the ideal of standardization is not an idle dream, but a real possibility once the conservatives can be overthrown by the farther sighted, progressive, public-spirited trader.

"Before much can be done to establish an international harmony in our weights and measurement systems, a great deal of ground must be covered towards the standardization of local systems in various countries. The United States can boast of at least a score of varieties of bushels, China of a good collection of different dollars and cents, the East of a various assortment of piculs, etc.

"Undoubtedly there are a great many difficulties to be encountered before even the most minor changes along this line can be realized, but the fact remains that the world is thinking in international terms as it never has before. Narrow provincialism is giving way to the broader world vision and the countries of the world are sincerely striving to get on a better basis of understanding as never before. Perhaps the time is far distant when a universal language will be in common business use throughout the world and the idea of an international monetary standard may be an idle dream, but a common standard of weights and measures for the business world is not only practical, efficient and logical, but a possibility. With all of our modern efforts towards speed and efficiency it is rather a travesty on the common sense of the business world to be still clinging to the present motley assortment of systems for weights and measures." (From "The Dutch East Indian Archipelago," Buitenzorg, Java; quoted in "Pacific Ports," September, 1921.)

POLAND: "The meter has been introduced as a unit of measure in all Poland, and the use of other measures is now prohibited." (In "Algemeen Handelsblad," Amsterdam, Netherlands, 28 October, 1919.)

LATVIA: "The Latvian Government has passed a law introducing the metric system, but the old Russian system of weights and measures may be used, where necessary, until 1 January, 1926." (In "Commerce Reports," United States Department of Commerce, 19 February, 1920.)

GREECE: "The Government Gazette published a new law passed by the Chamber of Deputies which makes the metric system the official system of measurement thruout Greece." (In World Correspondence, "New York Evening Post," 18 November, 1920.)

These excerpts will give some indication of the trend of world opinion toward world metric standardization. Since virtually all nations have already advanced to the decimal metric standards, naturally it would not be difficult to fill thousands of volumes with testimony from them as to the practical utility of these units. Enough has been presented, however, to show the unanimity of the world on this point.

In Chapter 11 of this book, "The Metric Movement Thruout Britannia," ample testimony is given to show that all progressive forces in the British Commonwealths are working in behalf of the world standards.

The present chapter has been devoted mainly to an exposition of the nationwide support of the metric movement thruout the United States of America. The opinions of thousands of influential individuals have been cited, representative of every group and interest in our population. In view of all this, can it be denied that fully 99% of all who have considered this subject are in favor of the Metric System?

Surely, a comprehensive answer has been given to the question, "Who Urges Meter-Liter-Gram?"

CHAPTER 10

WHAT WILL METRIC STANDARDIZATION COST?

THIS chapter contains evidence that the saving thru the metric system of weights and measures would at once compensate for any cost or difficulty involved in metric standardization. Proof is herein given that to continue using our present jumble of weights and measures means a loss of at least 15 billion dollars in the next generation.

In relation to this matter of Cost, it has been proposed that if any concerns can show that the metric advance would handicap them, these concerns should be licensed to use the old weights and measures until all equipment made on the old base may be worn out. No part of a manufacturing plant need be scrapt.

However, in reading this chapter, it should be constantly borne in mind that the present proposal before the Congress of the United States of America is that the metric units be adopted for exclusive use in **merchandising**, after a transition period of 10 years. Manufacturers are to continue to use whatever weights and measures in production that they desire. Section 8, Paragraph 2, of the Metric Standards Bill reads: **"Nothing in this Act shall be understood or construed as applying to the construction or use in the arts, manufacture, or industry of any specification or drawing, tool, machine, or other appliance or implement designed, constructed, or graduated in any desired system."**

The following material should be read with this proviso taken into consideration. The transition to metric standards is to be made gradually, with all interests amply protected, so that the advance shall be to the benefit of all and to the injury of none.

Since the original preparation of the material in this chapter (most of which appeared in World Trade Club booklet 12, under the title "What Will Metric Standardization Cost?") much very important testimony has been given before Congress which has direct bearing upon this aspect of the question. It has been deemed best to include that material, presented in 1921 and 1922 to the United States Senate Metric Committee, in the chapter, "Metric Legislation Before Congress." The reader is invited to refer to that testimony, and to consult the Index for other material bearing upon the Cost of metric standardization.

In each of the sections of this chapter a summary of the testimony is first given. Then follows the evidence itself:

PAGE
1. Metric Advance Easily Made 274
2. How the Transition Can Be Made 294
3. Metrics in Textile Industry 302
4. Land Surveys Are Excepted 306
5. Re-adjusting Scales and Weights 306
6. Present Wide Use in the United States 307
7. Strange Names Can Be Avoided 315
8. Now Is the Time 317
9. Present Jumble Causes Great Loss 318

1

Metric Advance Easily Made

Summary

There follows the testimony of pre-eminent men. They know the great loss the United States of America and Britannia are suffering from lack of metric standardization.

All of the statements that follow are backed by testimony of experts.

The Advance Is Simple

Advancing to exclusive use of metric units, they testify, involves only a change of arithmetic, a simplification in methods of computation. Initial intellectual effort to learn the use of simple decimal dollar-like metric units is as nothing compared to the loss of time, thot and labor resulting from the present antiquated jumble of weights and measures. Simply the numerical value of tools will be altered, **not the tools themselves.**

No Difficulty in Manufacture

Manufacturing is done by gages rather than by rules.

Ordinary employees who work on the drill press, lathe, or milling machine work to gages. They are not concerned with the unit of measurement employed. They work on the basis of a determined size. T. H. Miller, Superintendent of the De Laval Separator Co., states: "Employees of the De Laval Separator Co. did not know till more than a year after of the changed standard in our American factory."

Metric Units Lessen Work

Metric standardization will lessen and make easier the work for employees who must calculate—for brain-workers. These are the men who determine the sizes of gages.

The millimeter is exactly suited to the requirements of the engineer. It is superior to the inch. It permits the expression of finer limits with fewer figures. It reduces the chances of error. In precise work, such as the case of a bearing and shaft to fit it, decimal divisions are invariably used. Common fractions are entirely useless. Work requiring extreme care in templates and gages is done in decimals.

Engineering education makes one familiar with metric units. Machinists are deft and capable, so that the comprehension of meter-liter-gram presents no difficulty. The metric advance is easy for those who determine the size of gages.

Machinery Need Not Be "Scrapt"

Metric standardization will require no "scrapping" of machinery. Gages need not be altered. Their value can be expressed in millimeters. For manufacture one can convert readily and simply to metric units. Actual sizes seldom agree with nominal sizes. For most work simple rough conversion will suffice.

In the manufacture of sewing machines, guns, typewriters and similar work actual dimensions are largely disregarded. The parts are made to fit properly. Gages and tools are made to fit the parts. Here the bugaboo of cost in advancing to metric standardization fades into its "native nothingness."

Round Numbers Metrically Expressed

Rough and ready measures are easily expressed in metric units. In common life, divisions of meter-liter-gram need not be carried out with finical details. Ordinary measures are now true to round numbers. This would be also the case with metrics. Pipes are notoriously not of listed dimensions. They are not true to gage. Size can be as easily given in round numbers of millimeters as in incorrect fractions of an inch. Grocers will continue to spill an approximate amount of sugar into the scale pan, carpenters will saw on the pencil line. Metrics are well adapted for rough and ready measure.

Accurate Conversion Easy

Accurate conversion can be made to metric units with negligible error. The great firm of Willans and Robinson, manufacturers of engines at Rugby, British Isles, found no difficulty in interchanging parts. The U. S. American legal inch is based on the metric bar. This fact alone shows that conversion can be made to any required degree of precision.

Screw threads can not be made interchangeable by prescribing dimensions. The only way to make them interchangeable is by

obtaining taps and dies or leading spindles cut by the same tools. The exclusive use of metrics would involve no alteration in screw threads, altho the numerical value would be described metrically. The advance would be one of arithmetic.

Old Gages Expressed Metrically

In the case of pipe threads old gages would be called by approximate metric dimensions. The actual size would remain according to old standards. It is absurd to talk of throwing away "standard pipe fittings." For example, when we consider the "½ inch pipe tap" we find there is nothing about it ½ inch or near it.

Morse taper shanks for drills and other tools are known by numbers. The same dimension would obtain with metric standardization, but the numerical value will be expressed in millimeters.

Opponents Misconceive the Situation

Opposition to metric standardization is based on a misconception. Opponents are prejudiced or inexperienced. If American business men would take time to look into the subject they would find that metrics offer an irresistible appeal to the pocket. Arthur Chamberlain, Chairman of Kynochs, Ltd., Birmingham, British Isles (the great firm of Kynochs makes guns, shells, mechanisms, gunpowder, candles, soap, and so on), says, "The business man who objects to taking trouble to improve his system had better retire at once."

No Difficulty in Europe

Exclusive use of dollar-like metric units in France, Italy, Germany and 40 other nations has caused no important difficulty, no inconvenience, no trouble, no complaint. "What man has done man can do." Those who know testify that the transition has been made elsewhere in a few weeks without friction or trouble. American travelers in the Philippines, Cuba, Porto Rico and Panama become accustomed to metrics in 2 weeks.

Evidence

So much for the summary. Now for the evidence. Here is practical testimony concerning metric units in manufacturing.

LORD KELVIN, Pre-eminent British Scientist:

"Not one of the accurately standardized gages at present in use in engineering workshops will need to be changed when the metric system is adopted." *Decimal Educator,* p. 72, March, 1919.

UNITED STATES BUREAU OF STANDARDS, Department of Commerce, Washington, D. C.:

"It is the opinion of this Bureau that the benefits to be derived from the metric system are so great that the system certainly should be adopted." Letter to W. C. Bardon, Reinig Co., Helena, Montana, 28 October, 1919.

On scope and work of the United States Bureau of Standards: "It may be said that the Bureau occupies somewhat the same position with respect to the manufacturing interests of the United States that the bureaus of the Agricultural Departments do to the agricultural interests. Many industries are just beginning to realize the importance of precise methods of scientific investigation, which, in practically every case, involve some kind of measurement." *Machinery's Encyclopedia,* vol. 5, p. 539, 1917.

KENNELLY, A. E., Electrical Expert of Massachusetts Institute of Technology:

"The only serious objection to the metric system at the present time comes from a particular group of manufacturers. In most cases the objection does not come from their employees. Indeed the employees may not be aware that a change has been made from the customary to metric shop standards until long afterwards. The employees usually work with gages and templates on which no dimensions are marked. A change to metric shop standards may leave these gages unchanged. *Moreover manufacturers seldom object to the use of the gram or the liter. Their objection is limited to calling an inch 25 millimeters.*

"It is true that some manufacturers have many blueprints, catalogs and size records which would be upset by a transition to the international metric system with some attendant inconvenience and expense in renumbering, but *the idea that their machinery or their product must needs be altered has been shown by experience to be unfounded.* We should seek to bring about the advance in such a manner as to minimize the trouble to these manufacturers. *We would gladly consent to their retaining the old medley of weights and measures as long as they desired.* When they see the public adopting the change they will doubtless follow at their own convenience. The time has come for activity in forwarding the advance. I am sure the World Trade Club will push forward to inevitable success. With a little more effort trade can be conducted in the only international system of weights and measures universal all over the civilized world." *Letter to World Trade Club,* 24 November, 1919.

SIEMENS, ALEXANDER, Former President British Institute of Electrical Engineers, and Former President British Institute of Civil Engineers; Practical Manufacturer:

"The great question of cost has been raised again. I thot I had spoken about that enough, but evidently not, because the old bugbear has been trotted out again. I have already mentioned that engineering manufacturers and textile manufacturers are supplying metrical countries. Why should they not go on? If the United Kingdom adopts metrical measures there will be one country more to be supplied with metrical measures but it will make no difference. I have found—all of you have found—that we don't use the same pattern forever. We have to alter patterns, we have to make new machinery and new apparatus, and what is there to prevent us arranging that new patterns are made in accordance with the metrical system? There is no necessity for throwing away dies or micrometers or anything of that sort. Why should you throw them away? If you have gages what do you want measures

for? How many things in a workshop are measured by a 2-foot rule or by the meter rule? You do everything by gages; then why should you alter the gages? There is no necessity to interfere with the manufacturers at all. Manufacturing will go on exactly as it always has done. There will be some change in patterns, but only new patterns will be introduced and manufactured by the metrical system, exactly as our firm, and I am sure the lot of you, nowadays, manufacture according to the metrical measures, for metrical countries. There is not a farthing of cost to engineering works in the change." *Bradford and the Metric System,* pamphlet published by *The Decimal Association,* London, British Isles.

STRATTON, S. W., Director of U. S. Bureau of Standards, Department of Commerce, Washington, D. C.:

Shows incorrect character of objection to alteration of machines: "This Bureau has purchased and established machine shops and instrument shops, using the standard machinery, and finds no difficulty in constructing metric material on such machinery. *The Baldwin Locomotive Works not only were able to build locomotives for the French Government entirely in the metric system without changing their machinery, but they found that it cost not a cent more to make them in metric units with their standard machinery.* The gages alone, which are in any event the snap limit gages made specially for all new work, and renewed constantly for old work, make it quite feasible to minimize any possible expense due to using metric units. Of course you understand that no one proposes to change the sizes of useful things, but merely to designate them in a language of measurement known to the whole world." *Letter to World Trade Club,* 16 February, 1920.

MENDENHALL, THOMAS CORWIN, Former Director of U. S. American Geodetic Survey, Eminent Metric Author:

Outline of address before the American Engineers' Societies:

A. Cost of metric standardization:
   1. Only a relatively small proportion of tools and machines are in any way affected by the question of standards.
   2. The life of a tool or machine is comparatively short.
      a. There is deterioration from use.
      b. There are continual improvements.
      c. Patterns shortly become obsolete.
   3. There is almost invariably enough to spare in a casting which is to be machine-finished to make it possible to work it to metric dimensions.
      a. Similar conditions apply to apparatus and standards for weighing and measuring.
         (1) Balances are not affected at all.
         (2) Scales can be readily and cheaply adapted to metric units.

B. On alleged difficulty of metric standardization:
   1. 34 world countries have made meter-liter-gram the exclusive legal units.
      a. They have experienced no appreciable difficulty.
   2. History of the adoption of the American decimal currency furnishes a useful example of what may be expected.
      a. There was no appreciable difficulty.
      b. An incalculable saving was inaugurated.
   3. Here is typical testimony showing no difficulty in the advance to metrics:

SIEMENS, ALEXANDER, Former President British Institute of Electrical Engineers, and Former President British Institute of Civil Engineers (Mr. Siemens was living in Germany in 1871 when metric units became the exclusive legal standards):

"The advance was all a matter of about 2 or 3 weeks in Germany. It took place before the compulsory period began. Too many people have only hung a cloak around habit in order to hide its nakedness."

WILLANS AND ROBINSON, Large Engine Works at Rugby, British Isles:

"With the adoption of metrics in the Willans and Robinson shops the workers adapted themselves to the advance in 2 days."

There is an "embarrassment of riches" in testimony of this kind. *Science,* December, 1899.

No Replacing of Machinery:

BELL, ALEXANDER GRAHAM, Telephone Inventor:

"The old tools and machinery need not be thrown away; they can be used during the transitional period at whatever may be their metrical value. A tool or machine has only a limited life. It may last, say 10 years, and then it must be replaced. After the adoption of the metric system, the new machinery made would certainly be constructed to an exact metrical scale. The old machinery, however, so long as it lasted, would be measured by the metrical system, and you would simply rate it at its nearest equivalent in the metric system."

"The bill before the United States Congress is only mandatory covering the system of arithmetic to be used (the metric system), and leaves the question of tools, and so on, open. It relates simply and exclusively to a method of measurement. The weights and measures of the metric system shall be used—that is all. It does not prescribe the kind of tools or machinery or limit it in any way. Take the present tools and measure them in the metric system."

"It is a question of arithmetic, not of tools, or machinery. You can measure the work or output of the present tools and machinery just as well by the metric system as in the ordinary way. You can express the dimensions and weights of all the parts of the old machines, where required, by the metric system, and tho the measurements might not be exact to a fraction of a millimeter or a fraction of a gram, they could be rated at their true metrical value, or at a closely approximated value in exact measures."

Adoption of Metrics in Laboratory of Alexander Graham Bell, Telephone Inventor:

"No difficulty whatever was experienced in the use of the system, and the total expense involved in the change amounted to a few dollars. . . . The same balances formerly employed were equally efficient in weighing by the metrical system, and . . . the old weights . . . utilized as supplementary weights, with their value in grams distinctly marked upon them. No change was required in the machinery and tools employed, simply a change in the method for measuring the output.

"The use of the metric system in my laboratory has greatly facilitated all calculations, and the men like it." *National Geographic Magazine,* January, 1906.

Alter Numerical Values, But No Change in Tools:

KENNELLY, A. E., Electrical Expert of Massachusetts Institute of Technology:

"No ordinary machine, such as lathes, drills, shapers, and so on, would have to be changed if the metric system is adopted, because no one would be likely to insist upon having things changed to exact even sizes in the new measurements. The same old tools would go on making the same old things; but the numerical values of the sizes made would be altered. At the present time, the sizes of parts are seldom exact unit sizes. They have ordinarily to be expressed in units and decimals, especially when precision is required, so that under the new system, there would be merely a recataloging under new units and decimals. There would certainly be expense connected with the change, but it would be more of an intellectual character than of a material character. It would be essentially the expense of learning a new system, and of becoming familiar with it." *Scientific Monthly,* vol. 4 pp. 193-196, March, 1917.

SCHUHMANN, GEORGE, General Manager of the Reading Iron Co., a concern which in 1905 shipped 15,000 miles of tubular goods in the shape of wrought pipe, boiler tubes, and so on, (Manager Schuhmann lived in Germany when the metric units were adopted):

"While some new gages would be desirable, most of the existing ones for interchangeable work would be retained and simply be rechristened into metric terms if so desired. Much stress has been laid upon the fact that all the English dimensions cannot be expressed in metric units without going into many decimals, but for all practical purposes a few decimals will answer, and in most cases can be omitted altogether. The circumference of a circle in proportion to its diameter cannot be expressed exactly in figures, and still for all practical purposes, 3.14 is good enough."

"All that would be necessary would be to call the old gages by the approximate metric dimensions. Of course, it would also be desirable that the English pipe-tube threads, as well as bolt and nut threads, should be interchangeable with the United States and World standards, but that they are not interchangeable now is not the fault of the metric system.

"With the pipe-tube threads remaining according to the old standards, it would not be necessary to tear the old gas-tube pipes out of the houses or ceilings to fit the chandelier."

Germany adopted the Whitworth standards for screw threads, using them at first under the Imperial Royal designations. "These screw threads are still made in Germany according to the same Whitworth standards, but are now called by their nearest dimension in millimeters instead of fractions of inches. This, according to George Schuhmann, points the way how easy it will be to maintain existing standard gages." *Valve World,* February, 1913.

EDWARDS, G. B., Member of the House of Representatives in Australian Commonwealth:

"As an instance of how easy it is for an enterprising people—such as I hope we are in Australia—to adopt the metric system, I should like to read a report of what was done in the works of the celebrated Baldwin Manufacturing Company, Philadelphia. I have been in those works, and I have no hesitation in saying that they represent probably the most up-to-date engineering shops in the world. This company got from France an order for a large amount of railway material, and of course, the condition was that it

should be made up under the metric system. The report on that matter states as follows:

"'The drawings and specifications with the order came from the Paris-Orleans Railway, France, and were metric thruout. Instead of changing them into English units, the director, Samuel Vauclain, merely made shop drawings in metric units, and prepared metric gages and templates which, with some purchased rules, graduated to millimeters, were sufficient. *All measures were expressed in millimeters, and nowhere was an English unit allowed to appear. Not a mistake was made.* The common argument that an American workman cannot use the metric system, and that it is suitable only for scientific people, was refuted on the first day; in fact, millimeters were found to be simpler than feet and inches, which are liable to be misread on account of the accent marks. The director was converted to the metric system. He had some years previously advised the Franklin Institute that Congress should encourage that system by using it in government contracts, for which higher rates should be paid, but now he thinks that no such aid is needed. His workmen preferred the new system and took it up without any trouble at all. With them, to use it once was to understand it.'

"As regards the cost of new gages, templates, and the like, the director said there would be no loss, for these things are constantly wearing out, whereupon they are repaired by inserting new bushings which can be made to metric measure. The execution of this contract for locomotives went on while the rest of his works were using English measures, so, he thinks, the change could be made anywhere with little inconvenience. The important point of all this is that *the metric system was forced into the Baldwin Engineering Works at short notice by an order which required execution within 6 months, yet no serious trouble or expense was incurred.* Is it reasonable then that certain engineers and manufacturers elsewhere should oppose a law which would not force anything at all upon them, but upon commerce only, where the buying and selling of goods would have to be done by metric weights and measures? Moreover, the public would have longer notice than the Baldwin Company, for the (Australian) law would allow at least 2 or 3 years to prepare for the change." *Report of Debate on the Metric System in Australia,* pamphlet published by *The Decimal Association,* London, British Isles, 4 August, 1910.

Fear of Discarding Machinery Reduced to the Absurd:

MILLER, MAJOR FRED J., recent President American Society of Mechanical Engineers:

"If a brick becomes loosened from a wall [according to the absurd Anti-Metric objectors] the building must be condemned because the old bricks are made to inch measurements and metric bricks must be used to replace them."

"*Very much of the very best interchangeable work has been done with little or no reference to any standard measure of length. It is quite the custom in making sewing machines, guns, typewriters and similar work largely to disregard actual dimensions* in the construction of the first model machine and simply to make the parts to fit properly and so that the machine will do the work it is intended to do. The gages and tools of all kinds are then made to fit the parts of this machine and to reproduce them within the required limits of accuracy."

When one knows the facts, the bugaboo of the cost for metric standardization fades into its native nothingness. Only a blinded partisan could fail to be convinced. There is no need for manufacturers to abandon the standards they now have and to take up others having different dimensions. Actual sizes can be determined accurately by means of the metric micrometer. Only the arithmetical value need be converted.

"It means simply that all these refined measurements which are necessary in the maintenance of standards for interchangeable manufacturing are of necessity now measured by some decimal system; that their actual sizes seldom agree with nominal sizes; that the actual size of given gage can be expressed either in decimals of an inch or in decimals of a millimeter within the limits required by the nature of the work, whatever it may be, and that standards made by one system can be measured and reproduced by the other to any required degree of precision whenever circumstances may make it necessary or worth while to do so." *Electrical World and Engineering,* 5 November, 1904.

Many Sizes Arbitrary:

LITTAUER, L. N., Congressman, Glove Manufacturer, Metric Advocate:

"There are certain scales that have become arbitrary. For instance, screws of a small size are known as number 1, number 2, number 3 or number 4; they are not known by 16ths or 8ths, and you can go into a store and buy a number 2 screw or number 3 screw. Now, that can remain a number 2 screw or number 3 screw as well under the metric system as under the present system." *Metric Congressional Hearings,* p. 19, 1907.

No Discarding in Gas Industry:

"Under the metric system work will be done as before, using the same tools, the same Whitworth screw threads, and the same steel sections, but in speaking of them the 'World yard,' meter, and the millimeter will be used instead of feet and inches and 16ths [and 64ths]." *Decimal Educator,* p. 189, December, 1919.

Gages in Workshops not to be Changed:

VAUCLAIN, SAMUEL, when Superintendent of the Baldwin Locomotive Works (now President), before Franklin Institute:

1. "Since the men in machine shops work to gages they give little attention to actual sizes."

2. "Only the gage makers and designers need know about actual sizes. With their refined means of measuring they can work easier in metrics than in the present measures." *Electrical World and Engineering,* 5 November, 1904.

MILLER, MAJOR FRED J., President American Society of Mechanical Engineers:

Proves absurdity of objection to decimals:

1. Laborers work to gages. They are not concerned with the actual measurement.

2. Those who make the gages or other measuring machines determine dimensions by micrometer calipers.

3. For the sake of convenience and accuracy tool markers use decimal parts of an inch. *Electrical World and Engineering,* 5 November, 1904.

HOFFMAN, AUGUST, Skilled Machinist with broad experience in British Isles and Europe:

"It makes no difference to the man who works on the lathe, drill press, milling machine, and so on, what system he is working to, either metric or

English—or for that matter it can be called Bill, Mike or Harry; it is the same to him. He is working to gages and these gages are made to sizes according to the usage of the shop, and the man cares little about the name by which the system is called."

"The metric system is the best for the designer, and those who have to use their brains in the drawing office.

"For the men working the machines, gages will suffice for all their wants." *American Machinist,* 14 May, 1903.

TURNER, F. W., American Educator:

"In one case which has come within the writer's knowledge, the superintendent on hiring workers to work under this system, furnished measuring tools for the use of the worker, told them it was a new kind of an inch [25 mm., a 'world inch'] and he says that he never had the least trouble with them on account of it." *School of Science and Mathematics,* January, 1907.

BELL, LOUIS, M. I. E. E., Consulting Engineer:

"The metric units lend themselves quite as simply as any other to the rough-and-ready measurements of common life. For exact purposes the binary subdivisions of the inch are notoriously insufficient and those of the pound [which one?] are worse, while the metric units are exceedingly convenient." *Electrical World and Engineering,* 5 November, 1904.

MILLER, T. H., Superintendent of De Laval Separator Co., Expert:

"Only draftsmen and tool makers have very much need to understand any system more than to make use of an arbitrary scale in transferring dimensions on drawings." *Valve World,* May, 1913.

Metrics Cause no Difficulty for Engineers and Machinists:

BELL, LOUIS, M. I. E. E., Consulting Engineer:

"The real difficulties can hardly be regarded as formidable by anyone who knows both the metric system and the methods of industrial establishments. Once the engineers and the tool-makers get into line for metric measurements, the rest of the force follows almost automatically. And as the aforesaid 2 teams are composed of intelligent men, the change will be easy for them. In point of fact, within these, and also among draftsmen a considerable proportion, perhaps the majority, is, from previous education abroad or here, already pretty well used to the metric system. The machinist in general is deft and capable, and to insinuate that he will be perpetually muddled by changing from one set of measures to another is an insult to his intelligence." *Electrical World and Engineering,* 5 November, 1904.

WILLANS AND ROBINSON, Large Engine Works at Rugby, British Isles:

"After 4 years' working to meter-liter-gram the draughtsmen were unanimous in favor of metric standardization. They had found that metric units are easier to check and read. They require a smaller number of figures. Templates and gages of old drawings are easily marked with millimeter equivalents. Metric values were learned thoroly in 2 days." *Decimal Educator,* p. 95, March, 1919.

MEMBER OF FIRM OF WILLANS AND ROBINSON, Large manufacturers of steam engines and boilers, testified in 1900 before British Parliamentary Committee:

"Before coming here this afternoon I asked 4 or 5 of our men privately (not thru the works' manager) what they thot of the system which we

adopted a short time ago. There was not a dissenting voice among them, and especially they all agreed at once that millimeters were very much easier to work than to the English measurements." *Scientific American,* September, 1900.

HOFFMAN, AUGUST, Skilled Machinist with broad experience in British Isles and Europe:

"Comparing the time between the English and the metric built machines it is astonishing to note how much less time it took to build the metric than the English machines, altho we worked to both systems."

Metrics Simplify Work of Designer:

From the designer's or constructor's standpoint there is nothing so simple as the metric units. "He has his hundredth, tenth, millimeter, all in one, which is quicker to calculate when having a quantity of figures to sum up than having 6 feet 9 inches 7-32nds, which must always be taken into fractions and oftimes will not sum up." *American Machinist,* 14 May, 1903.

BRIGGS, E. R., Engineer for Willans and Robinson, Large Engine Works at Rugby, British Isles:

The millimeter needs few symbols, yet it allows a fine limit in which to express the size required. Altho the inch is nominally the U. S. American unit of length, "yet the designer has been compelled to construct a new one by continual subdividing until he has obtained a 1/16 inch, which is really his unit of length. As there is no recognized name for this virtual unit, it is written as a vulgar fraction in terms of the inch. Hence, in order to express a dimension up to one inch it may be necessary to employ as many as 4 figures (not to speak of dashes and ticks), up to a foot, 6 figures.

"On the other hand the metric system supplies a unit of length, the millimeter, exactly suited to the requirements of the engineer. By its means any dimension up to about 4 inches can be expressed in 2 figures, while up to about 40 inches requires only 3 figures. The millimeter being a smaller unit than the 1/16 inch, also permits of finer limits being used. Such a system thus permits of fewer figures being used on drawings, allows a finer expression of the required size, and by means of simpler notation greatly reduces the chances of error on the part of the workman reading the drawings." *Electrical Engineer,* 14 October, 1904.

Decimals Used for Accurate Work:

MILLER, MAJOR FRED J., President American Society of Mechanical Engineers:

"Many parts are not made to inches or common fractions of inches. For example, bearings and shafts to fit them are in nominal but not exact dimensions of an inch. Limit gages give the actual sizes. They will be determined by means of micrometer calipers or other measuring appliances which will infallibly be based upon decimal divisions of the inch. Common fractions are entirely useless for such work."

"Pipes and rods, even screws and bolts, are true to their alleged gage only in round numbers, which may or may not give the required degree of exactness. Pipes are notoriously not of their listed dimensions, and their commercial sizes could be given in round numbers of millimeters just as well as in incorrect fractions of an inch."

Metrics entail no extra difficulty in precise work even in transition. They give a big saving later:

"In working to templates and gages, the workman must use extreme care, independent of the system, and in much exact work it has been found necessary to work in decimals of an inch."

1. Verniers and micrometer calipers are graduated to decimals and nothing else.

2. It is now the exception when actual sizes of machine parts can be expressed exactly in any other way than by decimals.

3. Vulgar common fractions are utterly inadequate to express refined measures.

4. European builders escape constant reduction from decimal values to inch values in the drafting room and shop. They use consistent decimal metric units. *Electrical World and Engineering,* 5 November, 1904.

TURNER, F. W., American Educator:

"The refinements in manufacture have grown closer to such an extent that even the most rabid opponent of the metric system has found it necessary to adopt .001 of an inch as a definite unit. Even this unit is being subdivided, and, in shop parlance, is called a 'half thousandth' or 'quarter thousandth.' Attention is called to .1 of a millimeter as a far better standard. Where units have changed, it is worthy of note that such changes are always decimal. If decimalization is desirable, why would it not be advisable to adopt a system which is purely decimal?" *School Science and Mathematics,* January, 1907.

Convert to Metrics—Error to Negligible Quantity:

"It is stated by a contributor connected with the great engine works of Willans and Robinson at Rugby, England, that they have no difficulty whatever in making parts of engines by the metric system which will interchange with parts made to the English system, and it must be remembered that Willans and Robinson know as much about accurate interchangeable manufacture as any one else in the world, bar none. I very much doubt if there is a single engine building shop in America which does as accurate work and work that is as closely kept to a standard, predetermined size. They use both systems of measurement, avow that they prefer the metric and that the men do; and declare, as cited above, that work made in their shops by one system of measurement may readily be made to interchange with work made by the other system." The above is a simple statement of facts as to what is actually done. *Electrical World and Engineering,* 5 November, 1904.

BRIGGS, E. R., Engineer for Willans and Robinson, Large Engine Works at Rugby, British Isles:

Describes transition to metrics in shop's work:

"I have seen new machines built in the metric system side by side with existing lines built in the English system, and I have seen standard parts of one set of machines made to work in with standard parts of the other set, and I have also made and sent into the shops drawings in which a single large and complicated casting has been figured in each system. I can make no defence for this latter, but it shows what can be done in working the 2 systems side by side during the transition period." In *Hallock and Wade,* "Evolution of Weights and Measures and the Metric System," pp. 187, 188, Macmillan Co., 1906.

"Experience has proved that it is possible to use the metric system side by side with the English system, and that there is no difficulty in even making parts of one standard fit to parts of the other standard, and so

gradually, bit by bit, the old series can be withdrawn and none but the metric remain in use. The actual time taken in this transfer period cannot of course be fixed; it depends upon purely local conditions; but the shorter the better." *American Machinist,* 18 September, 1902.

SIEMENS, ALEXANDER, Former President British Institute of Electrical Engineers, and Former President British Institute of Civil Engineers:

"It is not possible to make screws interchangeable by prescribing their dimensions; the only way is to obtain taps and dies or leading spindles cut by the same tools." There is no difficulty in cutting any thread by means of a metrical leading screw. *Electrician,* 11 November, 1904.

No Machines Altered Except Weighing and Measuring Machines:

"A 6-inch lathe is just as suitable for making things to metric as to English measures, and the same is true of almost every machine in an engineering workshop, a boot factory, or a textile factory. There is no reason for changing the dimensions of a machine or of its product simply because they are to be measured in metric units. When inch measurements are stated in whole millimeters, the maximum error is not greater than 1/50th of an inch, a magnitude hardly appreciable to the layman and negligible in the vast bulk of measurements." *Decimal Educator,* p. 22, September, 1918.

OBERG, ERIK, AND JONES, FRANKLIN D., Editors of Machinery's Handbook, Associate Editors of Machinery, in collaboration with many prominent mechanical and electrical engineers:

Technical data shows ease of advance to metrics in thread cutting. There will be no "scrapping" of lathes. The following rule can be used to find the change-gears for cutting metric pitches with an English lead-screw:

"Rule:—Place the lathe screw constant multiplied by the lead of the required thread in millimeters multiplied by 5, as the numerator of the fraction, and 127 as the denominator. The product of the numbers in the numerator equals the number of teeth for the spindle-stud gear, and 127 is the number of teeth for the lead-screw gear.

"If the lathe has a metric pitch lead-screw, and a screw having a given number of threads per inch is to be cut, first find the "metric screw constant" of the lathe or the lead of thread in millimeters that would be cut with change-gears of equal size on the lead-screw and spindle-stud; then the method of determining the change-gears is simply the reverse of the one already explained for cutting a metric thread with an English lead-screw.

"Rule:—To find the change-gears for cutting English threads with a metric lead-screw, place 127 in the numerator and the threads per inch to be cut, multiplied by the metric screw constant multiplied by 5, in the denominator; 127 is the number of teeth on the spindle-stud gear and the product of the numbers in the denominator equals the number of teeth in the lead-screw gear."

"When a lathe is to be used for cutting threads both in accordance with the English and metric systems of measurements, what are known as translating gears are sometimes used. . . . By inserting these gears in the train of gearing connecting the lathe spindle and lead-screw, it is possible to gear the lathe for cutting a given number of threads per centimeter by using, in addition to the translating gears, the same gears that would be employed for cutting a similar number of threads per inch." *Machinery's Encyclopedia,* vol. 6, pp. 247-248, 1917.

Need Not Discard Taper Shanks:

MILLER, MAJOR FRED J., recent President American Society of Mechanical Engineers:

"The Morse taper shanks for drills and other tools were intended to be ⅝ in. taper to the foot. The later ones are that, but the earlier ones are not and their real taper per foot must be expressed—whenever it is of any importance to know what it is—in thousandths of an inch. Do we throw them away on that account? We do not, because it is important to preserve them and by means of the refined instruments of measurement now at our command we can at any time needful determine their actual dimensions. To pretend that if we adopt the metric system we must throw them away is to talk foolishness. These taper shanks are known by numbers and they would be known by the same numbers and would have precisely the same dimensions no matter what new system of measurements we might adopt."

Pipe-Tube Threads Not Scrapt:

"Their designating sizes are only nominal and their actual sizes must be and are, in the books, given in decimals of an inch. Taking a ½-inch pipe-tube tap, for instance, not a single thing about it is ½-inch or anywhere near it." Since this is true it is absurd to talk of throwing away standard pipe-tube fittings, especially since the metric caliper enables machinists to express sizes to any degree of accuracy in millimeters. *Electrical World and Engineering,* 5 November, 1904.

Some Twist Drill Facts:

BUTLER, THEODORE, European Representative of Whitman & Barnes, U. S. American Manufacturers:

"Perhaps there is no business in which the use of the metric system finds better illustration than in ours.

"We are manufacturers of twist drills and we have to manufacture them according to the following measurements for the United States and England, but the use of these measurements for all other countries of Europe is diminishing every year:

1. Stubbs numbers, 1-80.
2. Birmingham gage.
3. Imperial gage.
4. Inch sizes, from 1/64 to 3-in. by 64ths.
5. These latter sizes we must manufacture in the following shapes: straight shank long, straight shank short, with Morse taper shanks, with American taper shank, with square shanks for brace use, with square shank for ratchet brace use, and many other styles.

"For our European continental friends, we manufacture the mm. system exclusively, running from 1/10th mm. to 75 mm. by 10ths mm."

"It seems impossible that men could be found who would not immediately see the advantage of the use of mm. gages, when it is considered that the use of the mm. sizes steadily increases, that all countries, with the exception of the United States and England, are pushing forward, and have found the mm. system most valuable and preferable to the old system of inches and feet, which have been a source of trouble in all countries; when it is considered that countries which are far less advanced in mechanical and engineering skill and experience than the 2 countries named above, have been able to overcome the difficulty of the change, we should doubt that 2 countries like the United States and England could not with perfect ease

overcome the little difficulty that seems to be in the way, in order to obtain a system which all other nations have adopted, and which is really and plainly and undoubtedly far superior to the old system of unequal progressions and imaginary sizes." *Valve World,* November, 1912.

Fact That Exporters Use Metrics Disproves Expense:

CHRISTEN, T. A., Consular Agent for France, Provident Bank Building, Cincinnati, Ohio, United States of America:

"Objections have come chiefly from manufacturers of machinery, machine tools, and so on.

"As the Consular Representative of France, I have had to give any number of Certificates of Origin for machinery sent from this district to France, or to other countries thru France, and I have had an opportunity to see *that a large proportion of these machines and machine tools were manufactured according to the metric system* and that therefore, the manufacturers in order to get this trade, had willingly gone to the expense of having metric gages furnished to them.

"This proves, of course, that the expense cannot be so overwhelming as it has heretofore been claimed, for I have no doubt the manufacturers in question have still realized a reasonable and satisfactory profit.

"*It seems to me a very good time now,* when so many manufacturers are supplied with metric gages and standards *which they had to adopt* to supply war demands of metric countries, to press the adoption and exclusive use of the metric system.

"Sooner or later we will have to come to it." *Letter to World Trade Club,* 28 January, 1920.

STRATTON, S. W., Director of U. S. Bureau of Standards, Department of Commerce, Washington, D. C.:

Quotes statement given by a manufacturer of 3 steam fitting stocks: 1, Britannia; 2, U. S. America; 3, metric:

" 'They are all alike, except in the screw threads.' I said, 'When you send your fittings to France or Germany you don't find it necessary to change the tools in manufacturing except as to the attaching screw threads?' and he said, 'No.' Then I said, 'Why should you have to do any when you sell them to the United States of America?' He replied, 'We would not expect to.' " *Metric Congressional Hearings,* p. 287, 1906.

"I think the fact that American machine tool builders and manufacturers generally meet very quickly the conditions necessary to establish a trade in Germany or France (metric countries) is proof that they can meet those same conditions. There are very few manufacturers that have ever turned down an order from abroad because the order has come in the metric system. American manufacturers are just as bright and just as progressive as those of any country; the machine which is sold to a foreign country must turn out its output in the metric system and that is all that would be required, even in America." *Metric Congressional Hearings,* p. 305, 1906.

No Inconvenience, No Complaint, No Trouble:

LORD KELVIN, Pre-Eminent British Scientist:

"I think we may with advantage follow the example of other countries with regard to the use of the metric system. In Germany, France, and Italy, no inconvenience has resulted from the introduction of the metric system, and there has never been such a thing as a complaint. I am astonished at the shortness of time in which the system was adopted in Germany. The

change there occupied only 2 years. I have in my hand a statement by Sir William Ramsey, in which he wrote: 'I was in Germany during the change there; it gave no trouble whatever and was recognized within a week.'

"I believe that whatever difficulty may be caused in shops, in factories, or in engineering establishments, great or small, will, in 2 weeks or a month's time, be far more than compensated for by the diminution of labor which the change will produce."

Misconceptions as to the cost of metric standardization are owing chiefly to the fact that some machinery manufacturers do not themselves take the time and trouble necessary to look into this matter, but have taken at par the statements of one or 2 anti-metric freaks. *Report of British Parliamentary Debates,* pamphlet published by *The Decimal Association,* London, British Isles, 23 February, 1904.

MARTIN, A. J., Author and British Officer:

"It is principally the British Imperial Parliament which should wake up, there being more people alive to the situation than many of its members seem to suppose. *Surely British mechanics have quite the intelligence of the Japanese, who spontaneously made the advance.*" "One Language in Commerce," T. Fisher Unwin, London, British Isles, 1906.

Opposition Inexperienced:

MILLER, T. H., Superintendent of De Laval Separator Co., Expert:

"The main trouble with such people is, of course, that they have had no experience with the use of the metric units and, therefore, are not competent to judge or talk on the matter." *Valve World,* May, 1913.

WELLS, F. O., recent President of the Greenfield (Mass.) Tap, Die, Machine Tool Co., which made so many things indispensable to carrying on the war:

The use of this system of meter-liter-gram earned an additional annual dividend of $50,000 for the stockholders of that company—and cost nothing as it was instituted gradually. Paper read before American Metric Association, annual meeting at Pittsburg, United States of America, 28, 29 December, 1917.

How Metrics Work:

ROSSELL & CO., Ltd., Waverly Steel File, Tool & Machine Knife Works, Sheffield, British Isles:

"We may say that in certain sections of our business we have used the metric system very extensively for several years, and neither clerks nor workmen have experienced any difficulty whatever in working it." *Valve World,* November, 1912.

VAUCLAIN, SAMUEL, when Superintendent of the Baldwin Locomotive Works (now President):

"The Baldwin Locomotive Works handled a large order from France for a quantity of railroad material to be made from drawings and specifications that were metric thruout. Instead of changing the drawings into English units, Baldwin merely made shop drawings in metric units, and prepared metric gages and templates which, with some purchased rules, graduated to millimeters, were sufficient. All measures were expressed in millimeters, and nowhere was an English unit allowed to appear. Not a mistake was made."

As regards the cost of new gages, templates and the like, Vauclain said there would be no loss, for these things constantly are wearing out; old

templates could be bushed to metric measures and new ones made to the same standard, if needed. *Valve World*, November, 1912.

HALLOCK, WILLIAM, Ph. D., Professor of Physics in Columbia University, and

WADE, H. T., Editor, "Physics and Applied Science," "The New International Encyclopedia":

"As to the effect of the introduction of the metric system into the manufacture of machinery, we cannot do better than conclude by quoting from the remarks of Samuel M. Vauclain, superintendent of the Baldwin Locomotive Works of Philadelphia, Pa. Mr. Vauclain's testimony is not only interesting and most valuable from his high reputation as a mechanical engineer, but from the position that his company enjoys in the manufacturing world. Locomotives from its works have been shipped all over the world, while the actual manufacture has been systemized and specialized to such an extent that unrivalled speed of construction as well as largeness of output has been attained. Mr. Vauclain says: *'So far as the metric system is concerned from a manufacturer's standpoint, it certainly should have no terrors.* Where—in what workshop—can you find a dozen men who will measure the same piece of work and find the same result with the ordinary 2-foot rule, or such scales as are ordinarily provided for their use? Could any manufacturer in America today rely upon the accuracy of the measurement of its employees in its products? Instead of having first-class fits and interchangeability he would have first-class misfits and ruination of his trade.' Referring to the vast amount of fitting involved at the Baldwin Works, where there was in 1906 an output of 5 locomotives daily and a force of workmen aggregating 11,500, Mr. Vauclain goes on to say, 'it can readily be understood how poorly these locomotives would be fitted together if we relied upon each and every one of these 11,500 men to do the measuring necessary to fit these parts together with the drawings furnished by the draughtsmen in their hands.'" *Evolution of Weights and Measures*, pp. 188, 189, Macmillan Co., 1906.

KYNOCHS, LTD., Birmingham, British Isles, make guns, shells, mechanisms, gunpowder, candles, soap, so on:

Just before adopting the metric units thruout its extensive works, in October, 1906, the chairman of Kynochs, Ltd., said: "The only thing I take exception to is the suggestion that the inconvenience and expense of effecting the change creates an important difficulty.

"In the first place, as to the inconvenience: a business man who objects to taking the trouble involved in improving his system had better retire at once. *There is no room today for business men who are not capable of taking trouble, and, as a matter of fact, the trouble involved in the preliminary change will not represent a hundredth part of the trouble we continuously suffer from under the old confused system.*

"Secondly, in regard to expense: it appears to us that some people have an exaggerated idea on this subject. *Compared with the size of our works, and the magnitude of our transactions, the expense will be quite unimportant, and, in any event, it will repay itself in the first year.*

"We hope to have the new system in full working order by New Year's day [1906]."

In 1907, after metric standardization had been in operation for 2 years in Kynochs, Ltd., Mr. Arthur Chamberlain, chairman of the board of directors, wrote an article for the Manchester Guardian, from which we

quote: "The change will neither be expensive nor difficult. . . . *The cost is insignificant. It is estimated at 1/2 of 1% of a year's profit. The saving, on the other hand, in clerical labor, will repay this in the first year.* . . . So far from asking the clerks to learn anything fresh, we only invite them to forget old troubles. . . . In effect, our English unmethodized measures require us to refer to a number of tables having no relation to one another, and results can only be reached by compound arithmetic, while metrics need no tables." *Valve World,* November, 1912.

CRANE CO., Makers of World Famous Valves:

"We are not theorizing or speculating. We have worked at the bench and at the lathe. We have chiseled and turned and planed from drawings. We have set our calipers and gages by inches and by millimeters. We experienced no more difficulty in turning or filing or planing or boring to an inch than we did in doing these things to 25.39 millimeters. It was all the same to us so long as our rule graduations corresponded to the dimensions marked on the drawing." *Valve World,* March, 1913.

HALLOCK, WILLIAM, Ph. D., Professor of Physics in Columbia University, and

WADE, H. T., Editor, "Physics and Applied Science," "The New International Encyclopedia":

"To appreciate just what would be the immediate effects of the adoption of the metric system in mechanical engineering it is interesting to study the experience of a large engine works and machine shop in the British Isles—Messrs. Willans and Robinson, of Rugby—which enjoys a reputation for extremely accurate work together with progressive ideas associated with the best engineering practice. This firm employs in its works the metric measures of length, and not only are they preferred by their draughtsmen and engineers, but also by the workmen in the shops, who did not experience the slightest difficulty in accustoming themselves to the new system or to employing it interchangeably with the customary measures. Inasmuch as this shop has been and is now [1906] experiencing some of the conditions attendant on a transition period from the customary to the metric measures its experiences are of interest." *Evolution of Weights and Measures,* p. 187, Macmillan Co., 1906.

LEONARD & SONS, Ltd., London, British Isles, Manufacturers of Engines and Boilers:

"Our experience with the metric units during the manufacture of shells made us realize that their advantages over the present system are so great that there should be no hesitation on the part of any business man in advocating their adoption."

AVONSIDE ENGINE WORKS, British Isles:

"We have made many locomotives to metrical measurements, some as far back as 30 years ago." *Valve World,* November, 1912.

HALLOCK, WILLIAM, Ph. D., Professor of Physics in Columbia University, and

WADE, H. T., Editor, "Physics and Applied Science," "The New International Encyclopedia":

Consider wire and sheet metals: "The present tendency is to abandon all arbitrary gages and work to decimal parts of an inch requiring all materials to be furnished of such dimensions, a condition which can be easily deter-

mined with great exactness by a micrometer caliper of low cost. Now, the use of decimals presents no inconvenience whatsoever to the average mechanic, so that in such a transition period as regards standard sizes of materials there is every reason for adopting the metric system rather than waiting until further standardization on an inch basis shall have occurred." *Evolution of Weights and Measures and the Metric System,* pp. 176, 177, Macmillan Co., 1906.

PAGE, R. H., Vice-President of the Truscon Steel Co.:

"As Manager of the Foreign Trade Department of the Truscon Steel Company of Youngstown, Ohio, I desire to endorse and support the efforts of the World Trade Club of San Francisco to secure federal legislation which will result in the exclusive use thruout the United States of the Metric System of Weights and Measures.

"As you are aware, the Metric System has been legalized in practically every civilized country of the world and is the standard commercial and scientific system in nearly every civilized country with the exception of the United States and the British Empire.

"The United States is on the threshold of an enormous expansion in its foreign trade. It would strengthen our position with every foreign client—save possibly the British—and it would greatly simplify our foreign transactions, if our wares were sold in metric units.

"The conversion of our data to the Metric System for each foreign transaction involves an amount of clerical work and liability to error which is a serious drawback and a constant burden on our business as a whole.

"The Metric System is the only logical and convenient system of weights and measures which has ever been devised and its enforced adoption, once accomplished, would be a boon to every man, woman and child in the country.

"The difficulties in the way of its adoption are more imaginary than real, as the heavy equipment in the basic industries—such as rolls in the steel industry—are of short life and could be entirely replaced with metric sizes in 2 or 3 years' time. The more complex tools and dies would require somewhat longer to replace, but, meanwhile, the products thereof could be listed in their present metric equivalents. Many of our larger firms in certain lines already maintain duplicate equipment for the manufacture of metric sizes for their foreign markets, thus recognizing the importance of getting into step with the majority of the civilized nations.

"If concurrent action by the British Government could be brought about, the last ground for opposition would be removed; altho it would actually give American manufacturers a distinct advantage over their British competitors in foreign markets if the United States should be the first to make the change." Letter to World Trade Club, 28 May, 1919.

WHITE, J. G. & Co., Ltd., Electrical, Mechanical and Civil Engineers, British Isles:

"Two-thirds of all our business is now carried on the metric basis, and the experience in our draughting department and in our works of the advantages are so great that the matter seems entirely beyond question with us. . . . In our opinion, the quickest way to educate public opinion would be by forcing it on the notice of the public thru its adoption in their ordinary business by a considerable number of firms doing a reasonably large business." *Valve World,* November, 1912.

WEISS, CHARLES, A. M., I. C. E., M. I. E. E.:

"Among electrical engineers you will know that all testing of plants and machinery has for 20 years been according to metric units, and now manufacturers largely use the millimeter in the design of their machines." *Valve World,* November, 1912.

GENERAL ELECTRIC CO., London, British Isles:

"At our Carbon Works, we have since 1899 used the metric system." *Valve World,* November, 1912.

BRITISH ELECTRIC CO., London, British Isles:

"This Company has always used the metric system ever since the company was erected about 12 years ago [1900], and we are quite convinced of its superiority in engineering works." *Valve World,* November, 1912.

JONES, J. R., General Manager of the National Mosaic Tile Co., Mobile, Alabama, United States of America:

"To show you what we think of the metric system, beg to advise that we use it exclusively in the manufacture of all of our products, and find that it greatly facilitates matters in connection with our foreign trade.

"We are for the metric system first and last, and all other times, and sincerely hope that your efforts bear results." *Letter to World Trade Club,* 28 October, 1919.

McEACHREN, J. W., Editor of Valve World, Crane Co., Chicago, Illinois; Eminent Metric Author:

"The International Metric System may be put into general and practical use in the United States without any disturbance of existing standards of measurement, without any marked confusion in present working conditions, without any alarming disuse of present instruments of measurement or machinery, and without a cost that would appreciably lessen the value of the prospective advantages of such a change." *Valve World,* March, 1913.

HALLOCK, WILLIAM, Ph. D., Professor of Physics in Columbia University, and

WADE, H. T., Editor, "Physics and Applied Science," "The New International Encyclopedia":

"Making articles in standard sizes has been productive of the highest benefit to the manufacturer, and the specialization that has been brot about in American works and factories has contributed in no small degree to the position in manufacturing that the United States now occupies among the nations of the world. This system of standardization is also advantageous to the consumer, who in turn may be just as important a manufacturer, only turning out a more finished or more complete article. Let us see how the metric system would apply here. First, let us take the purely arbitrary standards which have no even dimensions. For example flour is manufactured and usually sold 196 pounds net to the barrel, yet there is no particular reason for this quantity, since flour sold in sacks for export, where it may be stowed the more readily in a vessel's hold, usually is packed 140 pounds to a sack. Now, if there were any reason for preserving these particular quantities they could be used in metric weights just as readily as at present, but appreciate the convenience if barrels of 100 kilograms and sacks of exactly half that amount were employed. True, the miller would have to adjust his automatic scales for weighing his flour, but the product would be turned out in even quantities, and the weight of carload or cargo would be

told at a glance from the number of barrels or sacks. *Every transaction from the time that the flour left the mill until it was divided by the retail grocer into 10 kilogram lots would be facilitated."* *Evolution of Weights and Measures and the Metric System*, pp. 175, 176, Macmillan Co., 1906.

"Take the case of the lumber mill, where planks, boards, joists, etc., are turned out on an inch basis. How near do these dimensions correspond in reality with the sizes they are sold for? In fact, in many instances planed boards of a certain dimension do not gage the dimension at all, but represent what remains after a board sawed approximately to that thickness has been planed. The carpenter and the cabinetmaker do not demand so high a degree of precision from the lumber dealer that the .4 of a millimeter, between 25 millimeters and an inch (25.4 mm.) cannot be disregarded and here again *it is found that most standard sizes of lumber can be readily described in metric measures without the use of decimal fractions, and no new machinery will be required except as new styles or sizes are demanded."* *Evolution of Weights and Measures and the Metric System*, p. 178, Macmillan Co., 1906.

In many industries the immediate gain is plainly greater than the immediate cost. For example, the British Northeastern Shipbuilders' Institute would gain by decrease in its labor bill. The weekly wages bill is £2,500 [$12,500], while the cost of the metric standardization would be about £100 [$500.] *Decimal Educator*, p. 9, September, 1918.

2

How the Transition Can Be Made

Summary

With the adoption of metric units each manufacturer would fix the length of his own transition period. Adoption of metric units by the United States of America would cause no important difficulty. During the transition period it would be easy to obviate difficulty. A minimum amount of loss could be avoided by extending the term of years for complete use of metrics in certain industries.

Machines would not be put out of use. Any manufacturer could keep old gages, templates and the like until they wore out. He could easily and readily convert the measures for selling purposes. Metric values of parts would be substituted at slight cost.

"License the Laggards"

Where necessary old values could be used until machine parts wear out. The U. S. American government could afford even to bear a share of the slight expense for metric standardization. This payment would represent only an exceedingly small amount of the gain taxpayers would realize. *The U. S. American government might license those who for prejudice or other reasons would be the laggards.* Those licensed would soon come into line as did the Swiss watch industry under similar conditions. They would realize that they had denied themselves advantages.

Experience Shows Ease

Past experience with metrics in Switzerland indicates what would happen in the United States of America. Metric standardization for commercial transactions (as proposed in the Britten-Ladd Bill) would precipitate general adopton of the metric units. Yet it is important to remember that the transition can be made easily with no "scrapping" of machinery. Every day progress compels the alteration of patterns and apparatus. Why not include the adoption of metric units with these? With normal renewal metrics can be substituted thruout. The simplicity of manufacture by dollar-like meter-liter-gram would inaugurate a great saving.

New Units for New Projects

New units would be applied to new projects. Old machines could be used until worn out, but metric standardization is essential for new machines or a new industry. A firm could wait for a suitable opening to present itself. With a new industry it would be just as convenient to go the "whole hog" from the start with meter-liter-gram.[1]

Evidence

Manufacturers Can Fix Own Transition Period:

STRATTON, S. W., Director of U. S. American Bureau of Standards, Department of Commerce, Washington, D. C.:

"I think the question of expense has been very greatly exaggerated, due to a misunderstanding of what would be required or what manufacturers would have to do in case the metric system was adopted. In those countries where the metric units have been adopted the laws which have been enacted have referred to commerce and trade, and I think that is what we have in mind when we speak of the adoption of the metric units here. The use in manufacturing has been gradual and has been left very largely to the interests involved." *Metric Congressional Hearings,* p. 305, 1906.

Machinery Would Not Be Scrapt:

"No such effect has resulted in any metric country, and the proposed law makes special provision against its occurrence in America." *Decimal Educator,* pp. 8, 9, September, 1918.

"*No metric law ever has caused or will cause loss in the workshop or factory.*" *Decimal Educator,* p. 56, December, 1918.

The Question Involved:

"Not to what measure a thing is made, but by what measure it is described and sold.

"Example: Clocks made according to English system—but sold by metric quantities." *Decimal Educator,* p. 134, September, 1919.

"As the proposed adoption of the metric system does not contemplate the immediate changing of existing sizes, threads, gages, etc., but a gradual change; and as only measurements would be required to be made in metrics,

[1] The establishment of a new factory in Los Angeles by the Goodyear Tire and Rubber Company is a case in point. This new factory uses metric units exclusively.

there would be not the slightest trouble in 'hooking up' even a 50-year-old fitting with the very latest product of the International Metric system." *Valve World,* February, 1913.

"It would not be necessary to change anything at the beginning but the system of weighing and measuring. The width and length of our goods could remain the same, our standard sizes could remain as they are, our packages need not be enlarged or diminished. Just adopt the International Metric System for our weighing and measuring and let the other matters come as trade develops and we get more widely and more intimately acquainted with the wishes and needs of our foreign customers." *Valve World,* October, 1914.

Feasible to Convert Tools to Metrics:

ALLCOCK, HARRY, M. I. E. E., Honorary Secretary-Treasurer, Manchester and District Decimal Association, Manchester, British Isles:

"Equivalents expressed even so approximately as to the nearest whole millimeter—thus dispensing entirely with the decimal point—could not differ from the original English Royal Imperial dimensions by more than 1/50th of an inch." This degree of accuracy suffices for the vast majority of dimensions.

"It is an unwarrantable assumption that British adoption of the metric system would necessarily involve dimensions of machine parts. Such is not the case, because obviously any dimensions now expressed in inches and parts thereof can readily be expressed in millimeters and parts thereof." *Electrical Review,* 17 January, 1919.

Exclusive use of metric units does not involve altered dimensions of machines. Inches and parts can be expressed readily in millimeters and parts:

"It should be remembered that a tolerance of 1/100 part of a millimeter demands much more accurate work than is usually obtainable in our machine shops, so that these opponents of metric measures who claim that metric equivalents of English Imperial dimensions can be shown only by employing 6 figures or so after the decimal point are obviously drawing on their imagination and appealing to the credulity of those whose support they seek." *Surveyor,* 8 November, 1918.

"It is a fact that our present standard inch is ultimately referred to and is based upon a standard meter bar which is the best standard in the possession of the Government and is, therefore, used as the ultimate reference standard of length for all dimensions, whether expressed in inches or millimeters." This fact shows that there is no difficulty in accurate conversion from customary to metric units. *Electrical World and Engineering,* 5 November, 1904.

GUILLAUME, C. E., Director of World Bureau of Weights and Measures at Paris, France:

"He urges that in the engineering trade, for example, that proposed innovation would not as is often alleged, necessarily put out of use all machines the dimensions of which could not be expressed in the Imperial Royal units. Later on when the machines were being replaced by new ones in the usual course, any slight modifications required might be introduced." *Nature,* vol. 93, p. 483, 9 July, 1914.

BOGART, F. H., Machinist:

Makes the following statement in article contributed to *American Machinist:*

"In the modern, efficient plant producing a high-grade product, practically all the tools, even tho they may be so called standard sizes, are made to special order, and one size is as easily obtained as another."

The above statement knocks the bottom out of the contention that metric standardization will cause a "vast expense" in replacing tools. At present there is no difficulty getting special sizes when they wear out. Practically all tools are of special sizes. With the adoption of metrics it will be just as easy to obtain metric as inch sizes.

This article by F. H. Bogart in the *American Machinist* on "The Manufacturing of Parts to Limits" refutes the alleged cost of metric standardization altho the writer is not discussing metrics:

"The fact that no essential dimension is ever absolute, but always has fixed limits of allowed variation, makes it possible to express nearly every essential dimension in not more than 3 figures of decimals."

Gages established limiting dimensions.

"The operator has no concern as to what these dimensions are in figures."

It is the size of the part that matters, not the value of the size.

Since these facts are true the only problem is that of computing to metric decimal units. This is a simple process. It is widely done already when working with present measures. "In the revision of drawings, fractions in 16ths and 32ds should be changed to easily computed decimals." *Decimal Educator,* p. 57, 1918.

No Correction of Drawings:

STUBBS, A. J., Member British Institutes of Civil and Electrical Engineers:

"At present in works and drawing offices where a few drawings to metric scales are handled no confusion results. How much less would drawings to the familiar scales need special treatment in the transition stages?" References to old drawings are not considerable. They are about 1 in 100. *Decimal Educator,* p. 13, September, 1918.

No Difficulty in Rough-and-Ready Measure:

"The grocer spills sugar into the scale pan until it is somewhere nearly balanced and lets it go at that, whether it is a pound here or 500 grams in Germany, and he can use the metric weights as easily as any other. The carpenter lays out his work, to a pencil mark and saws somewhere near it, whether in inches or centimeters." *Electrical World and Engineering,* 5 November, 1904.

Experience of Other Countries:

KENNELLY, A. E., Electrical Expert of Massachusetts Institute of Technology:

"Every country in the world which has adopted the metric system—and they are numbered in scores—has passed thru the period of transitory mental readjustment. None of them has ever gone back to the pre-existing mixture of units. *No machine, or machine parts, will have to be rejected or condemned because of the change. None were so rejected or condemned in the other countries when they changed."* *Letter to World Trade Club,* 4 March, 1920.

"Selling the goods is the supreme consideration."

"If metric countries find no difficulty in manufacturing to metric units with non-metric machines—which is the fact—why should we?" *Decimal Educator,* pp. 136, 137, September, 1919.

GUILLAUME, C. E., Director of World Bureau of Weights and Measures at Paris, France:

"Germany accomplished metric standardization without difficulty, very methodically and completely; and no one can say today that she regrets it." *Electrical World and Engineering,* 5 November, 1904.

Germany changed to the exclusive use of metric units in 2 years and Austria in 3, without friction or trouble. Alexander Siemens, the pre-eminent engineer, testified as to the introduction of the system in his own works, saying that it was all a matter of about 2 or 3 weeks. "As far as I recollect it," he added, "the metrical system was very largely adopted thruout Germany between 1 January, 1870, and 1 January, 1872, during the optional period. It was very largely adopted then and was found to work so well that when the compulsory time came there was nobody to be compelled." *Scientific American Supplement,* 24 February, 1900.

STRATTON, S. W., Director of U. S. American Bureau of Standards, Department of Commerce, Washington, D. C.:

In Germany: "They are today [1906] using the English screw threads, whenever they come in contact with certain classes of work but the general tendency thruout Germany is toward metric screw threads whenever a new machine is designed or a new industry started. Each country will settle such questions for itself; the change in technical standards will be a gradual one to the world system when it is practicable and economical."

Mr. Bowersock questioned: "Then there would be absolutely no change required [in tools]?" Mr. Stratton: "Practically none except in cutting metric screws. In that case any lathe can be made to cut metric screw threads by translation gears, a device which is in use in machine shops." (See Machinery's Encyclopedia, 1917, for process.) *Metric Congressional Hearings,* p. 308, 1906.

STONE, CHARLES W., Member of 55th Congress, United States of America:

"The optimistic view of adoption is expressed by Lord Kelvin, Pre-eminent British Scientist, in his testimony before the English committee, wherein he says:

"'I believe that the difficulty of making the change has been enormously exaggerated. I believe that in 2 weeks people would become so accustomed to the perfect simplicity and easy working under the metrical system that they will feel that instead of its being a labor to pass from one system to the other, it will be less than no labor—that is to say, it would be a very great saving of labor after the first day or 2 of beginning to use the metrical system.'

"And yet the testimony of actual experience nearly confirms his opinion. Alexander Siemens, Former President British Institute of Electrical Engineers, and Former President British Institute of Civil Engineers, testifying as to its introduction into his own works, says: 'It was all a matter of about 2 or 3 weeks; then the people were accustomed to it and did not ask any more for the old measures, but asked for the new,' and speaking of his observation of its general introduction into Germany, he said:

"'Q. Did I understand you aright, that it was about 4 years during which the transition took place? The act was passed in 1868, and it was made absolutely compulsory in 1872, was it? A. Yes.

"'Q. And there was really not anything that you may fairly call friction or national opposition on the part of the masses of the people? A. No, not at all.'

"Captain Sankey, Director of Willans & Robinson, Large Engine Works at Rugby, British Isles, after explaining the practical advantages of the system in his extensive boiler and steam-engine manufactory, testified, in answer to questions as to its introduction, as follows:

"'Q. Have you found any difficulty with your workmen in that respect? A. Absolutely none.

"'Q. I understand you found your men had not the slightest difficulty in adapting themselves almost immediately to the new system.' A. Not after the first few days. I asked that very question of the head of our tool room, and he said it was a little awkward for a time. I said, 'About how long?' and he said, '2 days.'" *U. S. American 55th Congress, 2d Session, House of Representatives, Bill 1597*, pp. 39-40, 1898.

Easy to Obviate Difficulties:

KUNZ, G. F., Dr., of Tiffany's (New York, Paris, London), President of American Metric Association, World Expert:

"The necessary adjustment of present to future conditions could be provided for by legislation authorizing an optional use of either one of the 2 systems of weights and measures for a certain term of years, or else by temporarily exempting certain classes of machinery manufacture from the obligation to use the new system for a few years, so that the change could be made with a minimum amount of loss or trouble."

"Indeed, in view of the widespread gain in time and money incident to the general use of the metric system, the U. S. Government might justly see fit to bear a carefully computed share of the actual cost entailed upon manufacturers in making the necessary changes, for this light charge upon the taxpayers would only represent an exceedingly small share of the gain they would realize by the innovation." *Nation*, 28 March, 1918.

BELL, LOUIS, M. I. E. E., Consulting Engineer:

"A small but noisy band of antimetric freaks have built a hypothetical structure of governmental coercion and restriction of personal liberty." *Electrical World and Engineering*, 5 November, 1904.

LEEDS & NORTHRUP CO., Electrical Measuring Instruments, Philadelphia, United States of America:

"We in our own plant have made considerable use of the metric system. It is true that we shall in all probability require some years to make a great deal of progress along this line, but we find that the existence of the new and the old system side by side does not involve any insuperable difficulties. We have found from practical experience that the advantages claimed for the metric system by its supporters are real, and the disadvantages brought forward by its opponents when not illusory are greatly magnified." *Letter to the Iron Age*, 22 March, 1920.

JOHNSON, G. E. M., Secretary of the London Decimal Association:

"Many exaggerated estimates have been made of 'the cost of the change to engineers,' nearly all based on the assumption that manufacturing engineers and manufacturers of all sorts would be compelled either at once or after 5 or so years to alter all existing machinery, tools, and so on, which cannot be used to make things to metric dimensions. This assumption is false, and is due to ignorance of the existing law as to weights and measures,

and ignorance of the proposals of the Decimal Association for the amendment of that law.

"A manufacturer may legally use any weights and measures he wishes in his workshop; he may select a lump of rock, and use that as his standard of weight, and the breadth of his thumb and the length of his walking stick as the units of length inside the factory. But if in selling his goods he specifies their dimensions or mass, he must use one of the present 2 legal standards, the metric or the British; we propose simply to retain the first as sole legal standard, and legislation to that effect will still leave the workshop in *statu quo*. Many manufacturers will change at once, others will do it by degrees; many, who do not sell their products by measure, will not be affected at all, and only the most retrograde will object, tho none of their machinery will need to be scrapped. None will be compelled to change workshop practice.

"The Decimal Association nevertheless points out that the exclusive use of the metric system in workshops will be of immense benefit. Considering the number of operations in production which directly involve the use of weights and measures, it is astonishing that our cumbersome archaic methods have been so long maintained, and that we have been able to do what we have done with such a handicap upon manufacture and commerce." *Decimal Educator*, pp. 215, 216, March, 1920.

Laggards Soon Realize Advantages of Metrics:

ALLCOCK, HARRY, M. I. E. E., Honorary Secretary-Treasurer, Manchester and District Decimal Association, British Isles:

U. S. Government could license those who believe that metric standardization would cause them loss. They would soon come into line as did the Swiss watch industry after Switzerland made provision for licensing the laggards. *"Ultimately the Swiss watchmakers realized that they had denied themselves advantages enjoyed by their fellow countrymen, and they accordingly came into line voluntarily by themselves adopting the metric system."* *Electrical Review*, 17 January, 1919.

99% of British Manufacturers Urge Metrics:

"Once the metric system has been established for commercial transactions, it will not be long before manufacturers realize that it will be to their advantage to conduct their affairs on the same basis, which they will do when they think fit.

"We do not concede that old units will remain—our manufacturers will see to that; *out of a total of 3,000 replies to a questionnaire issued a few years ago to British manufacturers, 99% were in favor of the adoption of world metric units."* *Decimal Educator*, p. 195, December, 1919.

CHAMBERLAIN, ARTHUR, Chairman of Kynochs, Ltd., Birmingham, British Isles (make guns, shells, mechanisms, gunpowder, candles, soap, so on):

"The matter became imperative with us because of the enormous mass of figures we have to deal with in our cost office, and we came to the conclusion that we would not wait any longer. . . . We have prepared tables to introduce the metric system everywhere thruout the works, and we have arranged to translate our results into English weights and measures for the benefit of the benighted English."

Kynochs adopted the metric units and its President, Arthur Chamberlain, declared that it paid for itself in one year at a cost of only ½ of 1% of a year's dividend. *Valve World*, November, 1912.

Buy and Sell in Metrics:

ALLCOCK, HARRY, M. I. E. E., Honorary Secretary-Treasurer, Manchester and District Decimal Association, British Isles:

"Many British manufacturers find no difficulty in selling, in metric measures, the goods which they manufacture in English measures." For example, British manufacturers of cloth sell in France according to metric measures. *Decimal Educator*, p. 21, September, 1918.

Alleged Necessity of Scrapping Pure, Unadulterated Camouflage:

"No metric bill that has ever been introduced has aimed at imposing the use of metric units upon the processes of manufacture; the whole point is the use of these units in commercial transactions, which need not affect workshop practice at all. This is a matter of supreme importance.

"Manufacturing methods are to us a matter in indifference—they are the concern of the manufacturer alone.

"That the manufacturer would find it to his advantage to use the metric units in his work we are convinced. and we shall endeavor to convince him, too; but we shall never try to compel him to do so." *Decimal Educator*, pp. 135, 136, September, 1919.

Technical Progress Eliminates Cost:

ALLCOCK, HARRY, M. I. E. E., Honorary Secretary-Treasurer, Manchester and District Decimal Association, British Isles:

"The ordinary rate of evolution in many industries has been accelerated by the experience of war to such an extent that 'the best practice' of pre-war days is already obsolete. Extensive 'scrapping' of patterns, and so forth is inevitable, and a unique opportunity of starting afresh on the metric basis is thus provided." *Electrical Review*, 17 January, 1919.

Patterns Become Obsolete in Limited Time:

"The existing patterns at any given date become either worn out or obsolete in design within a fairly limited period." With metric standardization they can be used for their full normal lives and then they can be replaced economically by new ones based on the metric units. *Surveyor*, 27 April, 1917.

Cost a Mere Decimal Point of Overhead Charges:

STUBBS, A. J., Member British Institutes of Civil and Electrical Engineers:

"The cost of the change for templates, gages, meters, dies, and so on, will for the most part only precipitate normal renewal, and will be a mere decimal point of the regular expenditure under many overhead charges, such as postage.

"There is little objection to or inconvenience in the use of conversion tables during the period of transition. In fact the rule for capable people applies here, that difficulties are made to be overcome—raised by the fearful, razed by the cheerful." *Institute of Electrical Engineering*, January, 1918.

SMITH, SAM, F. C. S., Inspector of Weights and Measures for County of Wilts, British Isles:

"There is sure to be a fairly long period for the transition from one system to the other, and during that time weights and measures will be wearing out so that the cost will be gradual and spread over a period. Whenever it comes I don't think that traders will find it anything nearly so costly as some appear to think."

The same may be said of the gages, measures, and so on, in manufacturing. *Valve World*, November, 1912.

Gradual Replacement Eliminates Cost:

GUILLAUME, C. E., Director of World Bureau of Weights and Measures at Paris, France:

"In our age, when industry progresses with enormous rapidity, it is exceptional that a machine of a given model should continue to be constructed, without important changes, for more than a few years. [See following Carnegie statement on 'scrapping.'] Afterward, and during the several years for which the old models hold, manufacturers have to keep some duplicate parts to satisfy customers; but whether, in the interval, measures shall have changed or not, that will have no influence on the obligation of supplying these additional parts." *Electrical World and Engineering,* 5 November, 1904.

CARNEGIE, ANDREW, Steel King, metric advocate:

"'Tis said I've more money than some. If so, 'tis because I've had more courage than some. I let the slow-coaches use the old machines—mine I chucked into the scrap-heap—quick."

New Firm Should Adopt Metrics in Full:

BRIGGS, E. R., Engineer for Willans & Robinson, Large Engine Works at Rugby, British Isles:

"With a new firm starting business it is just as convenient to adopt the metric system in full—that is, to go the 'whole hog' with S. I. threads—as it is to adopt the Imperial system." *Electrical Engineering,* 14 October, 1904.

GUILLAUME, C. E., Director of World Bureau of Weights and Measures at Paris, France:

"In the application of new measures to industrial constructions, there is one arrangement by which the expenses and the confusion of the period of transition can be decidedly diminished; and that is to apply new units to a new project, while preserving the old standards for all machines constructed at the time of [or before] the advance." *Electrical World and Engineering,* 5 November, 1904.

ALLCOCK, HARRY, M. I. E. E., Honorary Secretary-Treasurer, Manchester and District Decimal Association, Manchester, British Isles:

"Manufacturers engaging in new industries should, at the outset, base their designs on the metric system, and it is gratifying to note that this has been done, for example, in the case of the British magneto industry, which has been so successfully established in this country since the outbreak of the war." *Surveyor,* 8 November, 1918.

"Metric standardization will not require change of screw threads in a short space of time. The old units will be illegal only as a medium of sale but not as a medium of manufacture. Firms can wait until an opportunity occurs to make the advance. In the interval goods can be converted readily to metric values." *Electrical Engineering,* 14 October, 1904.

3

Metrics in Textile Industry

Summary

Adoption of metrics in the textile industry would entail no appreciable cost. Probably the strongest proof is shown by the fact that textile manufacturers are now exporting to metrical countries.

It makes little difference whether sales are by the yard or meter. The spinning machinery and looms are the same in either case.

Need for standardization in the textile industry is becoming more and more evident. A variety of pitch is used to "prevent interchange of parts between similar machines made by different firms." Metrics give the only common basis. An experiment in metric standardization at the Bradford Technical College, British Isles, recently proved that "The metric system was in every sense satisfactory."

Textile Technical College Experiment Proves Metrics Satisfactory:

BARKER, A. F., Director of Textile Industries, Bradford Technical College, British Isles:

"As a means of arriving at just and reasonable conclusions with reference to the employment of the metric system in the textile industries, an attempt was recently made to run the Department of Textile Industries of the Bradford Technical College entirely on a metric basis. . . . *This experiment proved that so far as yarn counting, cloth setting, orders for reeds, gears, etc., were concerned, the metric system was in every sense satisfactory; in fact it seemed probable that a worker changing from Leeds to Bradford or Bradford to Leeds would have greater difficulties to encounter than a Bradford or Leeds worker changing to the metric system." A Practical Experiment in the Employment of the Metric System in Textile Industries,* pamphlet published by *The Decimal Association,* London, British Isles.

Different Pitch Prevents Interchangeable Parts:

"The textile engineers have given away their whole case against the metric units in that the several firms making similar machines or parts of a machine have purposely adopted a slightly different pitch to prevent interchange of parts between similar machines made by different firms. Accuracy of pitch has so often in the past been noticeable by its absence that many of the best firms are or will soon be revising their models and gages. And why should not this re-gaging be on the metric basis? So far as loom-gearing is concerned, as this is changed at least every year, there would be little difficulty in running it all on to a metric basis within 2 years." *The Unification of Weights and Measures in the Textile Industries: The Possibilities of the Metric System,* pamphlet published by *The Decimal Association,* London, British Isles.

Cost Fears Are Unfounded:

CHEDVILLE, D., Vice-President of the Chamber of Commerce of Elbeuf, France, and Vice-President of the Permanent World Committee for Uniform Counts of Yarn:

"The weighing machines would remain the same, only the weights would have to be altered, and the graduation of the scale on the steelyards of the beam machines which would have to be marked with the 2 systems, but machines so marked are available now, and the scale makers are ready to supply at a small cost metric scales for existing beams.

"The spinning machinery, be it English, German, or French, spins yarns of various counts. Whether the counts are calculated in meters or in yards does not change any part of the mechanism.

"The reeling machine only would have to be modified when it is a question of delivering the yarn in hank.

"The looms are the same, whether they be English, German, or Belgian. We produce on them goods of any measurement, and whatever the make of the loom there is no difference in the cloth produced. Therefore such fears are unfounded.

"The British machine builders would have nothing to change in the models or patterns now in use. In our opinion, there is no occasion whatever to be afraid of the expense which will be entailed by the change.

"By the preceding we may conclude that the work of all those engaged in the textile industry would be affected in an advantageous sense by reason of the simplicity of the metric system, the use of which is so constant. The one who analyzes the cloth, the designer who invents new fabrics, will find their numerous calculations abbreviated and made more rapid.

"The spinner, without being under the necessity of making great changes in his machinery, will also see his calculations simplified. Liverpool has already accepted the decimal form in the quotation of cotton and has excluded from invoices and weighing the unit of 112 lbs., i. e., the cwt." *The Metric System and the Textile Trade,* pamphlet published by *The Decimal Association,* London, British Isles.

Makes Little Difference Whether Sales Are by Yard or by Meter:

STRATTON, S. W., Director of U. S. Bureau of Standards, Department of Commerce, Washington, D. C.:

"The fact that the textile industries in metric countries still use in part other weights and measures is not because they are any better suited for that industry, but because they buy their materials from countries which use the English system, and that they have been allowed to retain the old units wherever desired. After all, the only place the public comes in contact with these is in the buying and selling of cloth. Any other change in the weights and measures used in the textile industries should, in my opinion, be left to the interests involved." *Metric Congressional Hearings,* p. 305, 1906.

BLAIR, MATHEW, Textile Manufacturer:

"In textiles the Reed spaces would require to be altered, but no expensive change of machinery would be involved. At present Reed making machinery produces a multitude of scales, and the metric measurements of Reeds would present no appreciable difficulty.

"Opponents of the metric system in textiles magnify unnecessarily the difficulty of the calculations. At present, when we have to use yarns and materials all prepared on the old methods, we cannot apply the metric system to them without some trouble. But when the whole of the factors that we have to deal with have become metric, as would be the case were that system adopted, these difficulties would vanish, and the results in the metric system be brought out with greater ease and less liability to error.

"I believe that metric unit standardization would be a great boon to the world and hope to see it the only legal standard within the jurisdiction of Britannia and America." *The Metric System and the Textile Trade,* pamphlet published by *The Decimal Association,* London, British Isles.

JOHNSON, G. E. M., Secretary of The London Decimal Association:

"Lancashire can and does sell a very large proportion of its products in meters; *Mr.* **Lloyd George** *in 1907 said in the House of Commons:—'If they had orders for cloth manufactured on a large scale in the mills of Lancashire, they would have sent quotations in metric figures without any difficulty at all.'*

"No weights and measures law of this or any other country ever affected processes of manufacture; the law only steps in when a contract of sale is made in which weights and measures are specified. Textile manufacturers have no difficulty in selling in meters to the Continent, and it is only an extension of that practice to England that is asked for. Yet even if it were proposed to inflict a change in methods of textile manufacture, it can be shown that the adoption of metric counts would be of great benefit and would cost little." *Decimal Educator*, pp. 206, 207, March, 1920.

SIEMENS, ALEXANDER, Former President British Institute of Electrical Engineers, and Former President British Institute of Civil Engineers:

"The next interest to consider is the textile trade. Here, the opponents of the system contend, the cost of the change would be appalling because all present looms would become obsolete and would have to be replaced by new ones adapted to produce metrical widths of fabrics. I had better take that subject together with the subject of the engineering trade because about that the same is said. I say in reply to all these arguments, 'What are you doing now? Are you not exporting to metrical countries, are not engineers exporting to metrical countries? Haven't we in our works plenty of metrical dimensions to manufacture to; have we ever found any difficulty in doing it? Have we ever had to introduce new machinery specially to make a metrical thing? Never!' Even leading screws of English pitch can be used to produce screws of French pitch and vice-versa. You must put in one wheel with 127 teeth, which makes the change right. You will find you are absolutely correct. When before a Parliamentary Committee I was asked: 'Seeing that in the cotton trade the standard make is what is called 79 inches, 37½ yards, 8¼ lbs. shirting—which is known all the world over—wouldn't it in some way damage the reputation of the shirting if the figures had to be recalculated in all the markets of the world?' Well, at the time I had not sufficient time in which to make the calculation. What do you get when you recalculate? 79 inches are 2 meters within ⅓ of 1%; 37.5 yards are equal to 34 meters to within ⅓ of 1%; and 8¼ lbs. are 3¾ kilograms. So you see you have been entertaining angels unawares. You have been manufacturing to metrical measure. So why say it is difficult? The general experience is that wherever the metrical system has been used it has at once been accepted as by far the simplest and easiest to comprehend, while it has the great advantage of being international, which is more and more necessary now-a-days where the intercourse between countries is increasing rapidly." *Bradford and the Metric System*, pamphlet published by *The Decimal Association*, London, British Isles, 17 November, 1913.

More Serious Questions Than Capital Charges:

BARKER, A. F., Director of Textile Industries, Bradford Technical College, British Isles:

Simple trading account based on expenses of standard plant in textile industries:

Total cost of installation	£1,120	[$ 5,600]
Annual depreciation	84	[470]
Turnover of raw material	56,250	[281,250]

—*Decimal Educator*, p. 47, December, 1918.

The Real Problem:

"The first point to be realized in studying this problem is that fundamentally the metric system is not in question at all; *the real problem is that*

of the unification of weights and measures in the textile and other industries all the world over."

Textile Industry Can Easily Adopt Metrics:

"The textile industries are only just emerging from the embryonic state, and cannot as yet claim a scientific equality with the engineering and chemical industries. But here is an opportunity to take a lead. *No industry can so conveniently change its methods and come so readily into line with the truly scientific principles of commerce;* no industry can so readily set an example of industrial nobility and altruistic endeavor." *The Unification of Weights and Measures in the Textile Industries: The Possibilities of the Metric System,* pamphlet published by *The Decimal Association,* London, British Isles.

STRATTON, S. W., Director of U. S. Bureau of Standards, Department of Commerce, Washington, D. C.:

On opposition of a certain textile manufacturer:

"It is important to guard against undue weight being given to such opinions when considering other lines of manufacture or sale. The large export business of the textile industry seems to indicate that the measures used in the factory are not involved to the same degree as in other lines. *Usually all that is needed is that goods be sold by the meter in length,* which is just as easy to do as by the yard. Furthermore the widths as given in inches are not exact when bought and an expression to the nearest centimeter would probably be nearer or as near the correct length as is at present given in inches." *Metric System and Export Trade. Report to the International High Commission on the Uniformity of Laws,* in 64th Congress, 1st session, Senate Document 241, Washington, Government Printing Office, 1916.

4

Land Surveys Are Excepted

Summary

One point should be made clear. Survey of public lands is excluded from every metric bill. Land surveys will be completed and records will be kept in old units. The surveyor's link and chain are decimal subdivisions of the mile and accurate surveying is usually done to tenths of a foot. These decimal units will readily convert to metrics. No more labor will be occasioned than by the present obligatory process of converting tenths of feet to inches.

U. S. American Coast and Geodetic and Geological Surveys now make use of metrics.

5

Re-adjusting Scales and Weights

Summary

Metric standardization would entail a negligible cost in changing weights and measures. Readings on expensive scales can be remarked at slight expense.

Saving in Lead Pencils Will Meet Expense:

TURNER, F. W., American Educator:

"Simply the weights and the graduation plate on the beam would need to be changed. The expense would be trifling. It would be met by the *saving in lead pencils alone* in 5 years." *School Science and Mathematics,* January, 1907.

Re-mark Scales at Small Cost:

"Metric standardization would require no scrapping of scales. *Scale beams can be remarked to metric units at small cost.*

"As for solid and liquid measures in the old units, they are little used except barrels. In most cases these can be re-marked to liter equivalents." *Decimal Educator,* p. 9, September, 1918.

STUBBS, A. J., Member of British Institutes of Civil and Electrical Engineers:

"Cost borne in relatively small sums by business accounts in relation to turnover. The small business would have to disburse once for all a few shillings for a set of new weights. Progressive retailers during the last few years have 'scrapt' not only their weights but their scales in favor of direct reading balances. Those balances could be converted to the new weights for a relatively very small sum." *Decimal Educator,* p. 15, September, 1918.

Expensive Tools Not Changed:

STRATTON, S. W., Director of U. S. Bureau of Standards, Department of Commerce, Washington, D. C.:

"To build in the metric units would require the addition of new measuring tools, if it is desired to avoid translation, and in some cases new drills and such tools, provided it is desired to work in even metric sizes. But it is a mistake to suppose that the large and expensive machine tools would have to be changed materially." *Metric Congressional Hearings,* p. 288, 1906. [Owners of tools can wait until tools made on old measurements become obsolete.]

UNITED STATES BUREAU OF STANDARDS, Department of Commerce, Washington, D. C.:

"Practically all of the automatic weighing and computing scale manufacturers are making part of their output to read in metric units. This being the case, it would merely mean that they would stop making scales which read in pounds and ounces and devote themselves to the manufacture of the metric type. It would, of course, take some time to make this change and the Bureau would suggest that a period of 2 years should be allowed during which scales of either type might be sold, and an additional period of 5 or 6 years to allow for scales of the old type to wear out." (Letter to Industrial Properties Corporation, Louisville, Kentucky; 19 March, 1920.)

6

Present Wide Use in United States

Summary

Use of metrics is now widespread in the United States of America. A decimal money system has educated 100 millions of

people to understand the dollar-like metric units. All they need know in addition for rapid conversion to meter-liter-gram during the transition period is the following: meter is 10% greater than yard and can be called "world yard"; 500 grams is 10% more than pound avoirdupois and can be called "world pound"; liter is 5% more than U. S. American liquid quart and can be called "world quart."

Prejudice Disappearing

Prejudices of manufacturers are disappearing. Dollar-meter-liter-gram are used exclusively in the electrical industry (telephone, telegraph, radiograph, electric light, electric heat, electric power). All monthly electric bills are in metrics. Chemical and optical manufacturers use metrics virtually exclusively. Exporters and makers of material (from watches to locomotives) employ meter-liter-gram. The photographer, the jeweler, the sportsman, the scientist, the teacher, the grocer, federal officials and countless others employ metric units. We are approaching metric standardization in all relations of life. The World War was a great force for unified weights and measures. Essential metric standardization was inaugurated in the making of many materials, such as guns, shells, locomotives, rails, parts of bridges, tools and machinery, motor cars, army maps and aircraft.

World-wide Use of Meter-Liter-Gram

In 40 countries metrics are the only legal units. In over 200 countries they are recognized by law and used more than any other units.

Uses of Metrics in the United States of America:

NATIONAL WHOLESALE GROCERS' ASSOCIATION of U. S. America:

"7 years have now passed since we, as an association, championed the reform of our system of weights and measures in the United States and advocated the substitution therefor of the International Metric System.

"There has never been a time more opportune than now. There has never been a time when there was more discussion of the desirability of the change than now, in the press, in the magazines; in conventions, scientific, industrial, commercial. The returning soldier, sailor, marine, aviator, all have used it and know its simplicity and its advantages over our complicated, unrelated present system, and are ready to join the home ranks of those favorable to its adoption." *Report of Metric System Committee,* 13th Annual Meeting, 4, 5, 6 June, 1919.

DRAKE, F. R., Senior Member Drake & Co., Wholesale Grocers, Easton, Pennsylvania:

"We have the metric labels in practical use, ready for export trade (and domestic trade as well), where the metric system is known and more familiar than the English system; and, in addition, we believe these labels

will have great educational value along with the educational campaign we are conducting in the newspapers, magazines, and by every means of publicity." *4th National Foreign Trade Convention,* January, 1917.

"It [metric marking] will help to educate the American people in the metric system, and it will begin at once to reap the benefits for American goods abroad, especially in the South American countries, which a general adoption of the metric system promises." *Science,* 14 July, 1916.

STARK, O. G., President of the Inland Machine Works, St. Louis, Mo., United States of America:

"We are now having our labels printed showing diameter and widths of our piston rings in inches as well as in millimeters so that both kinds of measurements are shown on the label. This we consider an educational campaign for the American public so that they will gradually learn the metric system by personal observation of the weight and size of packages they receive." *Letter to World Trade Club,* 14 November, 1919.

Electric Monthly Bills in Metrics:

"All the monthly bills for electric lighting and power rendered from electric meter registrations in the United States are already metric. Every 5-cent piece fresh from the mint, weighs just 5 grams by law." *Scientific Monthly,* March, 1917.

Metric Standards Used Widely:

COLLINS, DR. JOS. V., Department of Mathematics, State Normal School, Stevens Point, Wisconsin, United States of America:

"Already electrical, chemical and optical manufacturing concerns use the metric units and system exclusively. The system is also used widely in medicines and other arts. Then all institutions of learning use the metric system exclusively whenever this is possible. All that is needed is to complete a good work well begun." *Scientific Monthly,* December, 1915.

Everyday Uses of the Metric System:

TELFORD, FRED, Metric Advocate:

"Few people realize how widely the metric system of weights and measures is employed in the United States of America. Yet, *sportsman and scientist, druggist and jeweler, farmer and physical director, housewife and health officer, librarian and manufacturer, even the Federal Government—all know and use the metric system.*

"The **scientific farmer** no longer wonders at 'calories' and 'grams' and 'liters' and 'centimeters'; he knows that the science upon which his agriculture is based depends upon investigation in which only metric units are employed. For instance, in the Babcock milk test, which is familiar to every dairy farmer, 17.5 cubic centimeters of sulphuric acid is added to 17.6 cubic centimeters of milk. Certified milk must, among other things, have less than 10,000 bacteria per cubic centimeter; and milk classified as 'Grade A' must contain less than 100,000 bacteria per cubic centimeter before pasteurization, and less than 10,000 afterward.

"The **health officer** determines the fitness of water for use by the number and kind of bacteria. He seldom approves of water containing more than a few hundred bacteria per cubic centimeter, regardless of the kind; and water is labeled 'good' only if it contains less than 100 bacteria per cubic centimeter. It is worth mention that in case of serious illness the bulletins issued by the physicians for public information now usually give the number of leucocytes and phagocytes per cubic centimeter of blood.

"**Scientific housekeepers** use metric units constantly. A balanced diet is of extreme importance in reducing the cost of food; and in figuring dietaries only metric units are employed. These figures are copied from a card giving the food value of a thick slice of white bread:

Weight	38.6 grams
Proteid	3.6 grams
Fat	.46 grams
Carbohydrates	20.39 grams
Total calories	100
Cost	$0.486 cent

"All tables of foods, it may be added, whether for man or beast, express fuel values in the metric unit called the calory.

"On 1 July, 1913, American **jewelers** began using the international carat, defined as 200 milligrams, for weighing jewels. **Druggists** have been using the metric system for some years. In some parts of the country **doctors** are slow to give up scruples and drams; but in eastern sections, and in the army and navy, metric weights are generally employed. Druggists thruout the country have the metric equipment.

"**Opticians and oculists** generally now employ the metric system in measuring glasses. Lens diameters and thicknesses are expressed in millimeters and the distance between pupils in fitting spectacles is almost always written on oculists' prescriptions as '65' or '68', or whatever the case may be, the optician understanding that millimeters are meant.

"The new **wireless** law of the United States uses terms of the metric system exclusively. The wave lengths permitted for amateur and commercial use are expressed in meters, while the daily time signals sent out from the government wireless stations are of 2,500 meters wave length and instruments must be adjusted to that scale in order to receive them.

Metric Physical Measurements:

"**Physical directors** in colleges and gymnasiums have been taking measurements of men and women for years in metric units. Weights are expressed in kilograms, height and chest girth in centimeters, lung capacity in liters, and so on. No large American gymnasium now keeps these records in English units.

Printing and Library Metric Uses:

"**Printers and librarians** frequently express the size of books in centimeters instead of using words like octavo and duodecimo. The following description is taken verbatim from an advertisement in a school paper:

" 'Elementary Arithmetic. 14x19 cm.'

"Many a **sportsman** received a shock in 1912 when he learned that all distances in the Olympic Games are expressed in metric units. The 100-meter dash displaced the 100-yard dash and 1,500-meter run the mile run; jumps were measured in meters and centimeters; and so on thru the list.[1] Only recently a French airman made a new altitude record; and all the press reports gave the height attained in meters.

Metric Machinery Exported:

"Recently the metric system has engaged the attention of **exporters of machinery.** Except for the English-speaking peoples, nearly every civilized or semi-civilized country in the world uses metric units only. These nations

[1] The 800-meter race is virtually identical with the 880-yard race; the 400-meter race is the 440-yard race, and so on.

naturally dislike to buy machinery whose dimensions are in English units. Formerly they had little choice, as English and Americans controlled the markets. Now, however, Germany is an active competitor; and *the employment of metric units in their machines* ***has given the Germans a great advantage.*** In fact, they have compelled English and American trade to install in their factories a second set of machines based on the metric system.

Why Have 2 Sets of Machinery?

"It is evident that the fight for the **world's trade** will have far-reaching effects upon weights and measures. **Standardization** has gone so far that it seems impossible to have in one country 2 sets of machinery with different dimensions.

Metric Units in Government Use:

"The **government** has been driven to rely upon metric units. The legal definition of our fundamental units of length and weight, the yard and the pound, are today based upon the international meter and kilogram. Because of the lack of other worthy standards, it was provided by executive order in 1893 that the yard is 3,600/3,937 of the international meter, and the pound 10,000/22,046 of the international kilogram.

Metric Units Used in Science:

"The metric system has been used for years in all **scientific work** except engineering. **Textbooks** of physics, chemistry and other sciences employ metric units almost exclusively. The focal length of lenses in compound microscopes, formerly expressed in inches, is now almost invariably given in centimeters. Graduates can now hardly be secured to measure cubic inches. Nearly all the scientific work of students and teachers, even in the high school, is done with metric units.

All Units Metric in Electricity:

"Metric units are employed by many other groups of people in the United States. In the field of **electricity,** for instance, all the units are metric. *Enough has been given, however, to show that millions of people in the United States of America employ metric units more or less, and that the number is constantly growing.*[1]

"There are 3 reasons that account for the increasing use of the metric system. The simplicity that makes it popular with scientists also appeals to the wayfaring man. In the English system there are 74 units having 56 names (18 of which like 'mile' and 'ton', are ambiguous). The metric system has only 5 root words and 7 prefixes. Moreover, it is based on a decimal system. Just as we wonder why the Englishman clings to his cumbersome pounds, shillings, pence and farthings, the German wonders at our high regard for feet, yards, and rods. A French schoolboy can tell in an instant that 3,756 meters make 3.756 kilometers; but it takes pencil, paper, time, and mathematical ability for an American to change 136 rods to feet or inches.

"The metric system also has the advantage that its fundamental standards have been prepared with painstaking care and accuracy, and are as nearly invariable as possible. Now that accurate standards and gages are demanded in nearly all trades, this is an important point. The United States never had a standard pound worthy of the name; and none of the standard yards prepared has been sufficiently accurate for modern purposes. With the metric standards, on the other hand, a body of eminent scientists worked

[1] Fully 10,000,000 warriors and workers of U. S. America and Britannia used metric units during the World War.

nearly 10 years merely in preparing the metal; and a still longer time was consumed in making and graduating the standards. It is not chance that our legal definitions of the yard and pound are based upon the international meter and kilogram.

"It is in new fields, however, that the metric system is advancing most rapidly in America. The English units are displaced but slowly wherever well established. Scientific agriculture and housekeeping, for instance, are of recent origin; so is electrical science. Scientists investigating in these fields use the metric units, and their units are taken up by the practical workers. As science is constantly opening up new fields, this means a rapid increase in the number of people using metric units." *Valve World,* November, 1912.

Adequate Facilities and Aids in Using Metrics:

STRATTON, S. W., Director of U. S. Bureau of Standards, Department of Commerce, Washington, D. C.:

"Aids and facilities for using the metric system in promoting export trade are available as never before. Metric sizes of material, metric gages, metric measuring instruments, are increasingly accessible, as indicated by the catalogues. So, too, metric data are found everywhere, in handbooks, tables of equivalents, charts, and rules. The Bureau of Standards has 3 publications—a pamphlet descriptive of the metric system, a graphic chart of the system, and a book containing definitions and tables of equivalents. *These are obtainable by exporters without charge upon application.* By the use of simple change gears lathes may be used to cut metric screw threads and other metric work, and manufacturers of such machinery will equip such lathes with metric lead screws upon request. Furthermore, common sense will co-operate with ingenuity in meeting any exigencies that may arise with efficiency. Never has the pressure been so great from all sides—foreign demands, scientific organization, the urging of merchandising of business—and never were the facilities for making the change as complete. *The difficulties have been greatly overstated, the present opportunity is unique, and must be taken at once if we would get and hold the foreign business of which until now we have merely dreamed.*

Extended Use of the Metric Units:

"The extent to which the metric system is used in foreign countries is not realized even by well-informed manufacturers. The enclosed summary shows the legal status of the metric system in the countries of the world. A second summary enclosed shows the legal status of the metric system in the United States. Its use in science and medicine is almost world-wide.

"The significance of this status is enhanced by the fact that China, a country of 400,000,000 people, is now in the process of adopting the metric system. After a world-wide investigation of the subject, the weights and measures commission of China reported that the metric system should eventually be adopted. They have therefore in 1916 promulgated the metric system as legal and official, and a transition system based on the metric system as an alternate. The Chinese steel works at Pan Yang (near Hankow, the southern terminus of the Pekin-Hankow Railroad) several hundred miles up the Yang Tse, laid out in the metric system, buildings, grounds, and roads are being planned and completed in metric units. The rails produced by this plant are also made so many kilograms to the meter and measure so many meters in length. Likewise the great project for reclaiming the flood districts along the Grand Canal is laid out in the metric system.

With the metric system adopted in Europe, Latin America, and China, our isolation with respect to units of weight and measures becomes steadily more complete. Already our liquid and dry measures are unique among the nations of the world, differing even from those of the British. It is therefore a most serious question whether we can afford to continue a system out of harmony with the rest of the world. Unification of weights and measures is quite as urgent a matter as the universal system of longitude and time. Such unification has been accomplished in scientific work the world over, and in 40 countries for other purposes; the latter is sufficient evidence of its feasibility.

"Commerce, technology, and science have on account of their international character, availed themselves of the advantages of the metric system more than manufacturing, which is local, and, unlike exporting, not in direct touch with world markets. Hence science and commerce with their world-wide outlook should be the advisers of industry, and their conclusion is that the first principle is to supply what the customer needs, and that international business requires international weights and measures. An exporter of New York City stated emphatically:

"'We shall never have a satisfactory foreign trade until we meet the requirements of the world market, one of the principal requirements being the use of metric measures when seeking the trade in metric countries.'" *Metric System and Export Trade. Report to the International High Commission on the Uniformity of Laws,* in 64th Congress, 1st session, Senate Document 241, Washington, Government Printing Office, 1916.

"Many British modern industries, such as the manufacture of motor cars, aircraft, electrical apparatus, and so forth, already employ the metric system in their workshops." *Surveyor,* 27 April, 1917.

Engineer and Man on Street Use Metrics:

PRICE, COLONEL A. J., Recent Commander British 2d West Yorkshire Regiment:

"If municipal engineers wish to make an analysis of water or sewage, or even grasp the meaning of an analysis, they must know the metric units.

"The British army for the past 2 years has been continually using maps drawn to metrical scales, and the meter is easily used by British officers and men. If the man in the street is to read his paper intelligently he must know the 2.8 mm. and the 77 mm. guns." *Surveyor,* 6 October, 1916.

Metrics Easy to Learn:

BRISBANE, ARTHUR, Editor:

"The average child of 10 can in 10 minutes learn all that 90% will ever have occasion to use of the metric units, if they know the metric decimal dollar and its decimal divisors and multiples."

No Spread in Adoption of Royal British Units:

"History tells of the past and guarantees the future." The Philippines, Porto Rico, Cuba and Panama use metrics almost exclusively. Increasing use of metric units in the United States of America shows that the logical metric values will expel illogical and jumbled values. "As to the issue of the conflict there can be no doubt." *Electrical World and Engineering,* 5 November, 1904.

The transition to metric uniformity has been easy in all civilized countries where the world system has replaced an older system. Metrics are easily learned and difficult to forget.

"In a week we would forget that we had ever been so foolish as to use anything but the easiest. For—other things being equal and right—the easiest way is the best; and that, in a word, is the metric system." *Engineering and Mining Journal,* 23 February, 1905.

More Radical Change for Germany in 1871 Than for the United States of America Now:

DRAKE, F. R., Senior Member Drake & Co., Wholesale Grocers, Easton, Pennsylvania:

"We believe that the adoption of the metric system by Germany, embodying as it did the casting aside of many traditions for the sake of efficiency, has had a great deal to do with the wonderful success of Germany as a world commercial power. The change, at the time she made it, was a much more radical one for Germany than the change for the United States of America would be now, for we are already using it in many scientific lines and commercial life." *4th National Foreign Trade Convention,* January, 1917.

World Experience Shows Value of Metric Units:

SIEMENS, ALEXANDER, Former President British Institute of Electrical Engineers, and Former President British Institute of Civil Engineers:

"Certainly there is no doubt about the beneficial effect of the adoption of this system by all countries, and I have no recollection of ever hearing that the metric decimal units have given rise to any difficulties." Objections to dollar-meter-liter-gram are based on fallacies opposed to world experience. "It does not appear that other countries have been ruined by discarding obsolete weights and measures." There is a pressing need to put an end to the existing confusion in Unitannia. *Electrician,* 11 November, 1904.

Metrics Would Make World Writings Accessible:

STUBBS, A. J., Member British Institutes of Civil and Electrical Engineers:

The scientific or engineering writer addresses the whole world. But if a British or American writer submits tabular work involving the present jumbled weights and measures this work is only accessible to a foreign colleague by laborious calculations. In the same way the British or American reader is barred from a clear understanding of world writings. The exclusive use of metric units would bring an enormous simplification of such work. *Decimal Educator,* p. 5, September, 1918.

"Can we admit that a system which is found so advantageous in France and Germany [in all the world except Unitannia] is unsuitable for us? Should we not make some momentary sacrifice to provide the coming generation with an arm which will enable all to think and work with less fatigue, and consequently, with more profit to the community?" *Decimal Educator,* p. 126, June, 1919.

What Man Has Done Man Can Do:

WOLLMER, H. E., of the Mercantile firm of Jacob Behrens & Sons:

"In Germany I noticed when the change was being made everybody became a teacher; the schoolmaster was a teacher, the shopkeeper was a teacher, and everybody had this very thing in view; the schoolmaster, the trader, the children, and everybody. It became a practical question. They knew they had to be ready when the time came, and they were ready before the time came." *Metric Congressional Hearings,* 1898.

JOHN PILTER (now Sir John Pilter), of the British Chamber of Commerce:

"Q. You had dealings with Germany about the time of its adoption? A. I had.

"Q. And, as far as you understand, its adoption was accomplished with, comparatively speaking, ease? A. Certainly. I have always understood them as speaking of it as having gone thru with scarcely any friction." *Metric Congressional Hearings,* 1898.

MR. ROWLETT, Merchant, Leicester, British Isles:

"I have property in Tunis, and I am obliged to spend a certain part of my time there each year. The people of that country, the Arabs and the negroes, have had introduced among them quite lately the decimal system of coinage; and within the last few months, perhaps 8 months, the metric system of weights and measures has been introduced, and they grasp it easily and without difficulty. They had before then a system of 12 saas to the ouiba, and 16 ouibas to the caffis; but they have learned the liters and the meters very easily." *Metric Congressional Hearings,* 1898.

STONE, CHARLES W., Member of U. S. American 55th Congress:

"That the testimony above cited was a fair statement of the experience of Germany, and that Austria's had been similar, was disputed by no one. The ease and readiness with which the Germans and Austrians made the change is beyond possible dispute or question.

"What man has done man can do. What the German, the Austrian, even the Arab and the African have so easily done ought not to frighten or deter the American. We can not admit ourselves less quick of wit, intelligent of comprehension, or capable of action than they. Beyond that we have advantages which they did not enjoy. We are familiar with the practical operation of the decimal system in our currency system, which they were not. A considerable element of our population is made up of immigrants from metric-using nations, who have brought here a practical familiarity with the system. Our children have been taught the principles of it in our public schools with more or less thoroness. It is already used in pharmacy and in scientific work and investigation. And more than all by previous legislation making its use permissive and legal, by the furnishing of its standards to the various States, by its recognition by formal order of the Treasury Department, by its permissive but limited use in the Post-Office Department, and in certain bureaus of other Departments, by its exclusive adoption in electric measurements—in all these and other ways *the way has been paved for the general adoption of the system to an extent previously done in no other nation. Hence the transition in this country should be materially easier than in any other nation that has made it." U. S. American 55th Congress, 2d Session, House of Representatives, Bill 1597,* pp. 39-40, 1898.

7

Strange Names Can Be Avoided

Summary

The United States of America can adopt metric standardization even tho avoiding strange names. Old terms of yard, quart and pound can be preserved. English equivalents would do just as well for unfamiliar words in metrics. Why not say "world yard" for meter, "world quart" for liter, and "world pound" for 500 grams? This is what they have done in Switzerland. As a result few people know that slight changes have been made in the units to make them

metric equivalents. The German "pfund" of tobacco is 500 grams, the "fass" of beer is invoiced by its real contents in liters. Even with American decimal coinage it is common in the West to call the 25 cents "2 bits" and in the South there is at least one city where the 5 cents is sometimes called a "picayune" after the old Spanish unit.

Can Avoid Strange Names:

GORE, J. H., Professor Emeritus of Mathematics, George Washington University, Washington, D. C.:

"So we who are still outside the pale of universality, can accept the good features of the metric system and preserve, if we like, our old words. We can call 500 grams a pound, the liter a quart, and the meter a yard; thus avoiding the use of terms that seem odd because they are strange. This has been done in Switzerland, and not one person in 100 knows that a slight change has taken place in the pound to make it equivalent to 500 grams." *Forum,* August, 1901.

"In certain sections of this land [United States of America] we hear the silver quarter—25 cents—called a 'shilling'; in other parts of this land it is called '2-bits'; while it is an undeniable fact that in one city the 5-cent piece is still called to a certain extent 'the picayune' after a Spanish coin of 6 and ¼ cents value, that was used in that section a century ago. Nor do I believe that these colloquialisms prove the failure of the American decimal system of currency." *Nature,* 30 August, 1917.

BELL, ALEXANDER GRAHAM, Telephone Inventor:

"The foreign words employed need be no bar to the use of the metric system, for they are really not necessary to the system at all—the English equivalents would do as well." Consider analogy of coinage: dollars and cents are the only terms needed. It is not necessary to use such terms as eagle, dime, mill, quarter and nickel. *National Geographic Magazine,* January, 1906.

Danes Use Metric Equivalents in Old Names:

"It should be noted that ever since 1861 the Danes have been using metric weights of 500 grams under the old name pound, so only the name will indicate the change." *School Science and Mathematics,* February, 1909.

French Use Old Names for Metric Units:

SIEMENS, ALEXANDER, Former President British Institute of Electrical Engineers, and Former President British Institute of Civil Engineers:

"Old names in France are preserved in some districts and in some trades, but in reality the measures in use are based upon metrical units." *Electrician,* 11 November, 1904.

Germans Use Vernacular for Metric Values:

BELL, LOUIS, M. I. E. E., Consulting Engineer:

The "Fass" of beer in Germany is really a metric value. It is always invoiced by its real content in liters. For the "Pfund" of tobacco Germans actually get 500 grams.

Old Names Based on Metric Units:

"The surviving non-metric names in metric countries are, with rare exceptions, either the conventional names of packages invoiced at their real metric values or vernacular names for particular metric values." Americans

can follow the same practice. It makes no difference what units are called so long as they are standardized and have simple metric relations. *Electrical World and Engineering,* 5 November, 1904.

8

Now Is the Time

Summary

Now is the time for exclusive adoption of meter-liter-gram. The few temporary difficulties of transition can be faced best now.

"Now is the appointed time." World War has assailed the American jumbled weights and measures. Use of metrics is widespread. The United States of America can effect the change in process of getting back to normal. Difficulties and expense will increase as the inevitable adoption of metric units is postponed. Over 2,000,000 of America's strongest men returned from France are accustomed to meter-liter-gram.

Metric units are necessary as the exclusive legal standards. Otherwise the community as a whole cannot enjoy the benefits of adoption. People will continue to be burdened with the inconvenience of present confused units. In ordinary life, metrics must be used to appreciate the saving.

Few Temporary Difficulties Best Faced Now:

ALLCOCK, HARRY, M. I. E. E., Honorary Secretary-Treasurer, Manchester and District Decimal Association, British Isles:

The inconvenience of the advance to metric units is less in the immediate future than it will be at any other time. Unitannia's ordinary standards have been rudely assailed by the World War. Unitannia can effect the advance to metrics virtually in the process of getting back to normal. Here is a step that Unitannia must take sooner or later. "Now is the appointed time!" At present the sentiment of the world is anti-German because of German disregard for world and human laws. Unitannians, however, cannot rely on such sentimental protection favoring them indefinitely. They should therefore act promptly and get thru their transition before Germany is rehabilitated in the world's esteem. *Electrical Review,* 17 January, 1919.

"Now Is the Appointed Time":

GUILLAUME, C. E., Director of World Bureau of Weights and Measures at Paris, France:

"Difficulties and the expense resulting will increase as the change is postponed—it is clearly to the powerful interest of the great American Republic to enter without delay into the ranks of an advance which has everywhere carried only benefit with it."

Exclusive Use Necessary:

"However well persuaded one may be of the excellence of such an advance it will be adopted with great hesitation, unless exclusive, a slight inconvenience being preferred to an effort which is intense but of short duration." Metrics must be used to appreciate the saving. Metric units have been adopted already in those industries where their advantages are more evident. *Electrical World and Engineering,* 5 November, 1904.

No Piecemeal Adoption:

ALLCOCK, HARRY, M. I. E. E., Honorary Secretary-Treasurer, Manchester and District Decimal Association, British Isles:

"I submit that any such voluntary piecemeal adoption cannot be expected, as the pioneers would thereby penalize themselves by throwing themselves out of touch with their neighbors." *Surveyor, 27* April, 1917.

STUBBS, A. J., Member British Institutes of Civil and Electrical Engineers:

"The interactions of modern life render it impossible to secure any considerable advance on permissive terms—it is not practicable for one or more districts, for one or more trades, or for one or more utilities or administrations to adopt any advance in weights and measures unless the metric units are made the exclusive legal standards." *Decimal Educator,* p. 155, September, 1919.

MARTIN, Major A. J., British Author and Metric Advocate:

"The British are waiting for one another as tho paralyzed.

"To avoid laying down a duplicate set of machinery for the home and foreign markets, many manufacturers have waited for a demand for goods in metric quantities to come from the retailers.

"The Retail Trader who would prefer the quicker decimal system cannot afford to play with his business and adopt the metric system, if all his competitors in the same town and district do not make the change with him. He is, therefore, waiting for the Wholesale Trader to alter.

"The Consumer is not individually concerned except indirectly, because he has a vested interest in the country which shows signs of losing its vitality, i. e., adaptability. He is therefore only concerned as a voter, and unless a general or exclusive law is passed, must wait until the question is put before the country. But it is not a party question!

"The Schoolmaster is waiting to discontinue teaching the British measures and weights until he is sure the Metric System will be universally adopted before his pupils enter upon their commercial careers. And so on.

"Whilst therefore the mass of intelligent people and the throbbing hives of industry are waiting for a law making metrics the exclusive units, about ½ of the Members of the British Imperial Parliament, of all shades of politics, are withholding the law 'until the system is adopted.' *The position reminds one of the old ditty:*

'Said Chatham, with his sword half drawn,
I'm waiting for Sir Richard Strachan:
Said Strachan, I'm longing to be at 'em,
But I'm waiting for the Earl of Chatham.'"

"The Empire which hesitates is lost." *"One Language in Commerce,"* T. Fisher Unwin, London, British Isles, 1906.

9

Present Jumble Causes Great Loss

Summary

Consideration of world trade demands and activities shows the absurdity of objecting to metric standardization as costly. The present "farrago of weights and measures" used in the United States of America causes an annual loss of millions of dollars in world business.

Metric Units Would Increase World Trade

Exclusive use of metric units would increase U. S. American world trade. With metric standardization after 1871 German world trade underwent a phenomenal growth.

Changed world trade demands have brot the need of changed units of weight and measure for the United States. Manufactured products have largely taken the place of raw material.

Present Units a Handicap

Our old grotesque weights and measures can not face competition in world trade. These archaic units cause an intolerable loss. Manufacturers now realize that they must supply metric countries with metric goods. Duplication of catalogues and machines is now necessary in order to comply both with the world units and with U. S. American unrelated weights and measures. Along with simple dollar-meter-liter-gram manufacturers must use a bewildering and antiquated jumble of units. The loss from time and effort spent in converting these values amounts to millions of dollars yearly in world trade.

Cheating Aided by Confusion

Present confused weights and measures in the United States of America facilitate cheating. World traders who do not understand U. S. American units may be abused easily in commercial relations. They realize this and are consequently prejudiced against American goods. An analogy in point arises in the case of a young American recently in London: "The cabman said half a crown. I gave him half a pound. He said, 'Thank you, Sir!' Next day I discovered that he ought to have given me some change." London "cabbies" realize that foreigners do not understand British Isles undecimalized money. Prospective Latin American and Oriental customers are no more familiar with the U. S. American heterogeneous weights and measures than Americans are familiar with British money.

Metric Units Only Possible World System

Meter-liter-gram are the only possible world units.

There is much specific testimony from exporters. They know that exclusive use of metrics would increase U. S. American trade. (Consular reports cited in Chapters 9, 13 and 14 of this book prove the absolute need of metric units to transacting world trade.)

Our false conservatism in neglecting metric standardization is a barrier to free exchange. It is inexplicable that the United States of America should continue to embarrass world business transactions by an "endless, senseless diversity of instrumentalities." Any seeming difficulty vanishes by looking at the adoption of metrics in the light of evolution. With the spread of commerce and advance from barter to world trade there have been first local, then national,

then world standards. Dollar-meter-liter-gram are the ideal units fitting into the natural scheme of evolution.

Present Tendency Toward Standardization

Industrial tendencies of the last 50 years have been toward greater and greater standardization of material. Standardization in thread cutting for machinery, and in printer's type, offer 2 notable instances.

Adoption of metric units is closely related to world standardization. There is great need for world uniformity in standard gages and fits. The exclusive use of metrics would be an important step in the direction of world standardization in machine parts and products. Remember, however, that metric unit standardization would in no way change existing technical standards, such as screw threads, gages, lumber measures, and so on. Metrics would facilitate the simplification of such standards, but the changes would be brot about as heretofore by the special interests involved.

Standardization will aid the work of world war reconstruction. We must adopt logical and uniform weights and measures. This is century 20. Co-operation is the tocsin of the new age and of the changed world.

Lessons of the World War

Lessons of the World War show how untenable is the objection of cost when all things are considered. Metric standardization is essential as a measure of military preparedness. The United States of America must have this "training in co-operative foresight to secure efficiency and perpetual preparedness."

Lack of metric standardization lengthened the World War. Valuable time was wasted and difficulties were enhanced for the Allies while the Central Powers worked under no such handicap. (See "Who Suffers?" section entitled "In World War," booklet published by World Trade Club, 681 Market Street, San Francisco, United States of America.)

Cost of Metric Standardization Overestimated

Alleged cost to be incurred by the metric advance appears only when one does not examine all angles of the subject. One must balance slight initial outlay by the enormous loss from the present brain-destroying jumble of weights and measures. Dr. Jos. V. Collins in the Popular Science Monthly for December, 1915, estimates the cost to the United States of America thru failure to standardize with metric units as $315,000,000 yearly.

The Great Loss Is From the Present Jumble

Loss from lack of metric standardization and gain from the exclusive use of metric units much more than offset any slight diffi-

culty of transition from the present encumbering weights and measures. Chaos and confusion would give way to simple dollar-like meter-liter-gram. Children in the schools could advance more rapidly. Study in mastering the 3 "R's" would be lessened. Metrics would make up for a great loss of time in the study of arithmetic. Little time would be needed to master vulgar common fractions. Teachers and students would be obliged no more to figure with a bewildering perplexity of weights and measures. A conservative estimate shows that children must remain in school "⅔ds of a year longer than would be necessary if the logical metric system were in their education."

Let the United States of America and Britannia remove unnecessary toll-bars from the path of education.

Metric Units Save Millions

Consider the loss from lack of metric standardization in business transactions. The type of loss found in the figuring at school mounts up with cumulative effect. Alexander Graham Bell, telephone inventor, gives specific examples showing the great saving realized by computing with dollar-like metric units. The simple, decimal correlation of parts and units gives the ideal standard.

In the Middle Ages merchants of the German Hanseatic League gave the British the German jumble of weights and measures. James Watt, steam engine inventor, gave the world the practical suggestion of a decimal inter-related system, whose units later became the metric units. The British let the Germans have Watt's work for nothing. The Germans got it. They scrapt their antiquated confusing standards. But the United States of America and Britannia kept this effete medley of units. Thus they have lost billions in world trade, world work and world war.

LOSS

If the United States of America and Britannia had made use of the greatest gift of James Watt to the world and had adopted in 1783 a simple, logical, inter-related decimal system of weights and measures, uniform thruout the world, (which became the metric system), there would today be a saving to them of $33,657,870,000—over 33 billions of dollars.

There is an annual loss to the United States of America and Britannia, thru impaired efficiency, of many millions — over $773,000,000. At this rate there will be a loss of 22 billions of dollars between 1922 and 1950. Metric standardization now will save 22 billions of dollars by 1950—and it will cost at most an infinitesimal fraction of that amount.

33 BILLIONS LOST—A CONSERVATIVE ESTIMATE

TO 1 JANUARY, 1922

Loss since 1783 sustained by the United States of America and the British Commonwealths thru adherence to the so-called system of weights and measures which they largely use, and which the rest of the world has scrapt:

Expressed in U. S. American Dollars

World Trade (1)[1]		**$2,832,000,000**
Other Business:		
Manufacturing (2)	**$1,342,500,000**	
Trading (3)	**775,000,000**	
Transportation (4)	**693,000,000**	
Mining (5)	**77,250,000**	
Agriculture (6)	**70,120,000**	
		2,957,870,000
Education (7)		**15,441,000,000**
Daily Life (8)		**102,000,000**
Translation (12)		**2,200,000,000**
Waste of Human Life, Time, Energy (13)		**10,125,000,000**
		$33,657,870,000

Total Loss to the United States of America and the British Commonwealths since 1783 thru lack of metric standardization—

MORE THAN 33 BILLIONS LOST

[1] Figures in parentheses refer to sections that follow, explaining how the estimates were arrived at.

ANNUAL LOSS—773 MILLION DOLLARS

Annual Loss to the United States of America and the British Commonwealths owing to the present jumble of weights and measures:

Expressed in U. S. American Dollars

World Trade (1)[1]		$ 64,000,000
Other Business:		
Manufacturing (2)	$45,000,000	
Trading (3)	25,000,000	
Transportation (4)	18,000,000	
Mining (5)	2,250,000	
Agriculture (6)	1,620,000	
		91,870,000
Education (7)		441,000,000
Daily Life (8)		2,000,000
Translation (12)		50,000,000
Waste of Human Life, Time, Energy (13)		125,000,000
Yearly Loss by continuing present jumble		$773,870,000

Loss in the World War due to the delay in adopting the metric system:

Expressed in U. S. American Dollars

Monetary Loss (9)	$ 5,000,000,000
200,000 killed (10)—Loss in productive power	3,200,000,000
400,000 wounded (11)—Loss in productive power	640,000,000
	$8,840,000,000

[1] Figures in parentheses refer to sections that follow.

LOSS SINCE 1783
THRU
Lack of Metric Standardization
IN
The United States of America and Britannia

Much testimony already given in this chapter indicates the amount of loss incurred by the English-speaking peoples thru retention of obsolete units. The sections that follow explain further how the figures in the foregoing tabulation of loss were arrived at:

WORLD TRADE

(1) A conservative estimate of the amount of **World Trade** lost to the United States of America and Britannia by not adopting the metric system is **$800,000,000 annually.** Considering profits to be 8%, the annual loss is **$64,000,000.** Using that as a basis, and gradually reducing the amount until the year 1783 is reached, the figure of $2,832,000,000 is ascertained, for the period from 1783 to 1922.

Metric System in Export Trade:

STRATTON, S. W., Director U. S. American Bureau of Standards, Department of Commerce, Washington, D. C.:

"We shall never have a satisfactory foreign trade until we meet the requirements of the foreign market, one of the principal requirements being the use of metric measures when seeking the trade in metric countries." *Report of International High Commission,* Washington, Government Printing Office, 1916.

"One may imagine the time and labor lost in these processes and the tendency to prevent growth of American commerce that these vexations must exert, for where other things are equal the 450,000,000 of metric potential customers naturally incline to deal with those who speak the same quantity language as themselves." [That is, metric units.] *Science,* 12 January, 1906.

Metrics Remove Chief Handicap in World Competition:

PRICE, COLONEL A. J., Recent Commander, British 2nd West Yorkshire Regiment:

"The great growth of Germany's trade practically dates from the time she used metric weights and measures." Exclusive use of metric units removed the chief handicap in German competition with the rest of the world.

"Before an English firm can sell its goods to the world it is necessary to convert English weights and measures into metric units, and it has been said that while an English traveler is busy converting his measurements and prices into metric units, the German secures the profitable wage work." *Surveyor,* 6 October, 1916.

Lack of Metric Units Holds United States Back from First Place as Exporter:

WELLS, W. C., Chief Statistician, Pan-American Union:

"So long as we cling to our inches, yards, pounds and gallons we carry a weight, a useless weight, that of itself is sufficient to hold us back from that

first place as an exporter of highly wrought manufactures which is ours by right of skill, enterprise, and resources. . . . We must adopt the metric scale." *Decimal Educator,* p. 150, September, 1919.

MANUFACTURING

(2) The figure of $6,000,000,000 is used as the profit of the United States of America and the British Commonwealths annually in manufacturing. The loss in clerical labor and the other resulting inconveniences due to the present jumble of weights and measures will certainly amount to at least ¾ of 1% of the annual profit in manufacturing. This means an annual loss of $45,000,000 to the United States of America and the British Commonwealths due to inefficient measures. By gradually reducing this figure back to 1783, the loss to date, $1,342,000,000, is reached.

Testimony from Kynochs:

Austin Chamberlain, Chairman of the Board of Directors of the great industrial concern of Kynochs, Birmingham, British Isles, testified that the transition to metric units in their works cost about ½ per cent of a year's profits; and that the saving, in clerical labor alone, repaid this in the first year. There was also a great saving in added efficiency, and in cutting down cost of selling products thruout the world.

Gradual metric standardization, as proposed by the Britten-Ladd Bill, will insure that every existing size may continue indefinitely to be used, but after a definite date sizes shall be described in metric language units, understood thruout the world. This means an immense saving, with any possibility of loss in transition reduced to an absolute minimum.

TRADING

(3) The loss in trading is estimated at $25,000,000 for a year, and by gradual reduction until the year 1783 is reached, the entire loss, $775,000,000, is ascertained.

SCHIEFFELIN, DR. WILLIAM JAY, President, Schieffelin and Co., New York City:

With the metric system there is a possible saving of time in:

1. Writing—about 50%.
2. Weighing—about 45%.
3. Calculating original formulae—50%.
4. Calculating increase in original formulae—50%.
5. Pricing—55%.

With average saving of time of 56% in the above processes. *Address before American Metric Association, December, 1919.*

TRANSPORTATION

(4) In transportation there is an annual loss of $18,000,000. This figure is based upon the 2 quotations below; but it has been increased 100% due to the decrease in the value of money since 1878.

DEWEY, MELVIL, Pre-eminent Librarian, New York, said in 1878:

"A competent committee carefully estimated the difference by using the metric system instead of the common system in the computations of a single railroad and reported that $50,000 could be saved annually." *American Metric Bureau Bulletin,* 1878.

FELLOWS, FRANK PERKO, Merchant and Capitalist, Wolverhampton, British Isles, said in 1862:

"It has been stated that the London and Northwestern Railway Company would save about 10,000 pounds a year thru the adoption of the metric system." *British Parliamentary Report,* 1862. (2000 miles of track.)

MINING

(5) In **mining**, as in manufacturing, the annual loss of **$2,250,000** is ¾ of 1% of the profit. The total loss is reached by the gradual reduction of that figure until 1783.

AGRICULTURE

(6) The annual loss in this instance is considered ¼ of 1% of the annual profit due to **agriculture.** The lowering of the percentage is due to the fact that there is ordinarily less clerical work in regard to agriculture than there is in the above-mentioned lines of business.

EDUCATION

(7) The loss in **education** is based upon the authoritative figures of Dr. Joseph V. Collins, Stevens Point, Wisconsin, United States of America.

Loss to United States of America:

Cost in school taxes of keeping 2½ millions of children in an extra ⅔ year	$ 50,000,000
Cost of supporting 1½ millions of children ⅔ year	100,000,000
Loss of productive power of 1½ millions of youths for ⅔ year	75,000,000
Loss in earning power due to driving out children from schools by difficulties of arithmetic as now taught	25,000,000
	$250,000,000

—*Scientific Monthly,* vol. 1, pp. 250-252, December, 1915.

The loss to Britannia has been estimated on these lines and included in the total figure.

DAILY LIFE

(8) In **daily life** all the above factors enter into the estimate: saving of time, greater accuracy, less waste of pencils and paper, and so on.

Ease of Cheating with Confusing Standards:

COLLINS, JOS. V., Department of Mathematics, State Normal School, Stevens Point, Wisconsin, United States of America:

"One powerful reason for the adoption of the metric system (different in character from the others) is the ease of cheating by the old system. In the past the people have been unmercifully abused thru short weights and measures. Many of the states have taken this matter up latterly and prosecuted merchants right and left. 90% of this trouble would disappear with the new system in use." *Scientific Monthly,* December, 1915.

ELIAS GOLDBERG, in the New York *Evening Globe,* 5 March, 1921: "One of the favorite methods of exacting a toll from people is to palm off on the unwary housewife liquid measures for measuring dry commodities. This is the practice in practically all parts of the United States, and Department of Commerce officials claim shortages of about 14% result. On one staple article of food $8,000,000 was lost by short-weight deliveries. There must be assurance to everyone that payments cannot continue to go to the unscrupulous, protected as they are by the confusion in our antiquated jumble of weights and measures. Let us have the simple decimal system of weighing and measuring, called the metric system. Let us have the Britten Bill enacted."

WORLD WAR

(9) **World War**—Items (9), (10) and (11) are calculated upon the basis that the war would have ended 2 months sooner if the United States and Britannia had been standardized on the metric units—meter-liter-gram.

CROWELL, BENEDICT, Assistant Secretary of War, Director of America's Munitions during World War:

"Weeks and even months of time on the part of whole staffs of experts working at high tension were consumed in translating French designs into terms of standard American shop practice during the World War. The decision to adopt the 75 millimeter size and modify the other 2 guns of this dimension, giving us interchangeability of ammunition with the French, was an historic episode in the American Ordnance development of 1917." *America's Munitions,* Report of Director of Munitions, 1917-1918.

Suppose that for the above reason the war was lengthened only 2 months, what does that mean? It means this: During every month of the World War 100,000 men were killed; 200,000 were wounded, or missing. Thus 2 months' delay means the needless killing of 200,000 men; the needless wounding of 400,000 more. It means that metric standardization would have saved the world the suffering, the poverty, the destruction of earning power represented by these 200,000 deaths and 400,000 injuries. (See World Trade Club Book 7, *Who Suffers?*)

CRAMMOND, EDGAR, Financial Expert, British Isles, says:

"The cost of the war will equal $260,000,000,000." *Commercial and Financial Chronicle,* vol. 108, p. 2.

(10) In estimating the productive power of the men who were needlessly killed in the World War, $800 a year per man for a period of 20 years is used as a basis. (See No. 9.)

(11) The loss of productive strength is estimated at $800 a year per man for a period of 2 years. (See No. 9.)

TRANSLATION

(12) This item of translation loss is based on the cost of translation of our weights and measures into metric units and vice versa in order to deal with the metric world. This is but a conservative estimate of the loss to the United States and Britannia owing to their stubborn persistence in clinging to an obsolete "system" of weights and measures.

(See quotations from W. O. Wilson, H. L. Chapman, G. C. Pisani, George Henriquez, F. G. Bolles, A. J. Martin, Benedict Crowell, and others cited in this chapter.)

WASTE OF HUMAN LIFE, TIME, ENERGY

(13) This tabulation should include loss of $125,000,000 annually (and of $10,000,000,000 since 1783) due to the loss of time and energy, mental perturbation, and strain put upon human beings by our jumble of weights and measures. This strain has shortened human life. Let us say that the period of life, time and energy lost is 3 months. Surely that is worth $100 or at least $10 to every one of the 500,000,000 human beings in the United States and Britannia. Taking the average length of human life to be 40 years there is a loss of $5,000,000,000 every 40 years or $125,000,000 annually. By gradually reducing this figure until the year 1783 is reached, $10,000,000,000 is found to be the loss from the time of James Watt to the present day.

EVIDENCE

Metrics Would Increase Trade:

STRATTON, S. W., Director of U. S. Bureau of Standards, Department of Commerce, Washington, D. C.:

Report to International High Commission:

1. Metrics needed for export:

(a) Metric units meet the need for intelligent catalogs and price lists.

(b) Metric standardization will meet the insistent demand for products in metric sizes.

(c) Exclusive use of metrics will satisfy the customer's requirements.

"A characteristic of even the more conservative manufacturer is his readiness when he really appreciates the situation, to put out rather full lines of metric products side by side with his regular line."

2. (a) What is the chief objection?

Cost: "The fact stated previously that firms opposed to the general adoption of the metric system already carry metric-sized products for export indicates that it is profitable to do so. Some of the most conservative firms have for many years carried such lines of metric products side by side with those based on the customary units. The experience is that the prices of such metric products are no higher than the corresponding English-sized products, especially measuring tools. A casual examination of tool catalogs

is convincing on this point. An experience such as the manufacture of French locomotives in a Philadelphia locomotive works using metric measures for this purpose shows how by intelligent handling any anticipated expense can be minimized or even avoided."

"A common fallacy is that standard sizes now in customary units would have to be changed. Where a size is the most efficient size, it need not be changed. Where it is not the most efficient size, it should be changed whether we change our system of measures or not."

(b) Are certain lines less adaptable than others?

"All products naturally cannot be produced in metric units with equal facility.

"Textiles and machines appear to some to be less adaptable."

"Many years ago the Waltham Watch Co. found it convenient to adopt the metric system in their large plant for all purposes. So much for delicate mechanism.

"Manufacturers of lathes are furnishing metric lead screws and change gears, and in small tools meeting the demand for metric sizes. Then in heavy machinery, such as that found in the locomotive, an example has just been cited showing that such manufacture is entirely profitable."

3. What will be the effect upon the scale and tool trades of any systematic movement in this direction?

"The effect will be, as in all considerable innovations, to awaken a measure of opposition, not in the sales departments, but among the older workers among whom set practice has removed the fine edge of enterprise."

"There is not a scale or tool maker of any note today who is not making scales (weighing or measuring) or tools working to size such as drills, reamers, etc., who is not already making such products also to the metric sizes.

"The effect will next be to awaken the ingenuity of the younger trained technical men in meeting the demands of the world market. Attention to the world units of measurement will in turn awaken their desire to assimilate the best in foreign practice in order to improve products and methods of manufacture."

"The change is naturally one of magnitude, but changes more sweeping have engaged most of our industries within a generation. The whole process of making electric lamps, for example, has been changed 3 times within a generation; one railroad has been rebuilt 3 times during the lifetime of men now living; and the practice of generating and distributing electricity is changing so rapidly that it is difficult to keep apace with it." *Metric System and Export Trade, Report to the International High Commission on the Uniformity of Laws,* in 64th Congress, 1st session, Senate Document 241, Washington, Government Printing Office, 1916.

Increased Trade Will Soon More Than Repay Initial Cost:

KUNZ, G. F., of Tiffany's (New York, London, Paris), President American Metric Association, World Expert:

"It is not wise to disturb any industry, but even those industries most vitally affected by such a change will find that if they make all their new machinery on metric units, it will not be many years before they will be making all their machines according to metric equivalents. And as the cost of production is the same or less, the increase in trade resulting from the worldwide use of their products will more than repay any imaginary possible inconvenience caused."

"The increased demand for goods from South America and the movement among our North American manufacturers to take advantage of the check to European exports to that part of the world, in order to introduce our productions there more widely and more consistently, work in the same direction. For American manufacturers are slowly learning the important lesson that if we wish to increase American trade in the world, America must endeavor to conform to the standards and usages current in the world." *Nation,* 28 March, 1918.

ALLCOCK, HARRY, M. I. E. E., Honorary Secretary-Treasurer, Manchester and District Decimal Association, British Isles:

"Are we [Unitannia] forever to remain deaf to the advice of our world commercial representatives both government and private—who for years past have urged us to adopt the metric system?" *Nature,* 6 June, 1918.

Exclusive Legal Use of Metrics Most Important Industrial Advance of the Century:

BLOW, CAPTAIN GEORGE P., Manufacturer, La Salle, Illinois:

A party of the U. S. American Manufacturers' Association visited Latin America to secure first hand information as to the best policy to adopt in acquiring Latin American trade. Here is the testimony of a member of that party, a practical business man:

"If we wish to sell goods it is obvious that the units of weights and dimensions should be given according to a system which would be understood by the purchaser—in other words, in the metric system—and I believe that **the exclusive legal use of the metric system would be the most important industrial advance of the century. I know of nothing which, in my opinion, is as important in the development of world relations as the adoption of the uniform system of weights and measures commonly called the metric system."** *Valve World,* October, 1914.

KENNELLY, A. E., Electrical Expert of Massachusetts Institute of Technology:

"The national and international advantages would, it is generally conceded, go far beyond defraying the necessary inconvenience and expense of changing the numerical scales and measures of the things which we use. It is not likely that this would involve any appreciable change in the things themselves." *Scientific Monthly,* March, 1917.

STRATTON, S. W., Director of U. S. Bureau of Standards, Department of Commerce, Washington, D. C.:

"Any manufacturer who, thru ignorance, fear of confusion, or lack of enterprise, is unwilling to attempt to meet the requirements of world trade should confine attention to domestic trade. He should not, however, be permitted to retard the development of world trade by his inertia or indifference to metric units, which are now exclusively used in 34 of the countries whose trade we seek. Still less should his opposition or his opinion have consideration in comparison with the judgment of those who seek earnestly and by all possible means the extension of trade with metric countries." *Metric System and Export Trade. Report to the International High Commission on the Uniformity of Laws.*

Success in Trade Depends Upon a Common Understanding:

WILSON, WOODROW:

"There is no man who is more interested than I am in carrying the enterprise of American business men to every quarter of the globe. I was

interested in it long before I was suspected of being a politician. I have been preaching it year after year as the great thing that lay in the future for the United States, to show her wit and skill and enterprise and influence in every country in the world." Philadelphia speech, 4 July, 1914.

"These states lying to the south of us, which have always been our neighbors, will now be drawn closer to us by innumerable ties, and, I hope, chief of all, by the tie of a common understanding of each other."

"Comprehension must be the soil in which shall grow all the fruits of friendship." Mobile speech, 27 October, 1913.

"The real wealth of foreign relationships, my fellow-citizens, whether they be the relationships of trade or any other kind of intercourse, the real wealth of those relationships is the wealth of mutual confidence and understanding. If we do not understand them and they do not understand us, we cannot trade with them, much less be their friends." *World of Business,* Address at Grain Dealers' Association, Baltimore, U. S. America, 25 September, 1916.

"Science affords an international language just as commerce also affords a universal language, because in each instance there is a universal purpose, a universal plan of action."

"We should see that every unreasonable obstacle is removed and every reasonable help afforded that public policy can afford."

"We call ourselves a liberal nation, whereas, as a matter of fact, we are one of the most conservative nations in the world. If you want to make enemies try to change something. You know why it is. To do things today exactly the way you did them yesterday saves thinking."

"This country, above every other country in the world, gentlemen, is meant to lift; it is meant to add to the forces that improve. It is meant to add to everything that betters the world, that gives it better thinking, more honest endeavor, a closer grapple of man with man, so that we will all be pulling together like one irresistible team in single harness."

"There is a task ahead of us of most colossal difficulty. We have not been accustomed to the large world of international business and we have got to get accustomed to it right away. *All provincials have got to take a back seat. All men who are afraid of competition have got to take a back seat. All men who depend upon anything except their intelligence and their efficiency have got to take a back seat.*"

"Now it is as if the nations of the world sampled and united here, were in their new union and new common understanding turning about to serve the world with all the honest processes of business and of enterprise." *Democracy of Business.* Address at Salesmanship Congress, Detroit, United States of America, 10 July, 1916.

KENNELLY, A. E., Electrical Expert of Massachusetts Institute of Technology:

"In no department of American manufacture has there been so important a decrease in importations and increase in exportations as in the iron and steel trade. America is putting highly manufactured metal into every market of the world in rapidly increasing quantities, but there can be no doubt that if gages, weights, dimensions and measurements of all kinds which we employ were based upon the almost universally used metric units, American manufacturers could make and sell large quantities of goods which they cannot now place abroad." *Popular Science Monthly,* February, 1905.

Inexplicable False Conservatism:

GORE, J. H., Professor Emeritus of Mathematics, George Washington University, Washington, D. C.:

"The failure of the United States of America to adopt the metric system is one of the most inexplicable instances of false conservatism in the history of the country. In face of the fact that almost every civilized government has seen the necessity of a common system of weights and measures to facilitate the exchange of commodities, the people of the United States of America have persisted in retaining the old and cumbrous system, which might have served those who believed in non-intercourse with the outside world, but which stands as a barrier to that freedom of exchange to which the whole world is now tending. We send consular representatives to every quarter of our globe for the express purpose of making possible an extension of our world trade, and then busy ourselves in an attempt to make such world trade impossible, and retain a system of weights and measures which adds to our own difficulties and makes us mere barbarians to the most progressive nations." *Forum,* August, 1901.

German Merchants Keen to Make and Sell to Wishes of World Buyers:

STUBBS, A. J., Member British Institutes of Civil and Electrical Engineers:

"World trade after the war will have to be carried on in the metric units, with which the German is already perfectly equipt. If the British Isles adopt the metric system, it will become universal." *Decimal Educator,* September, 1918.

REDFIELD, W. C., Recent U. S. American Secretary of Commerce:

"I am speaking as an American manufacturer with some 20 years of touch with an American industry, in which the majority of our customers were themselves manufacturers."

"In almost every German factory the business was based upon research which they carried into details that may seem to us trifling. The use of science, however, on their part and the lack of it on ours cost us a great deal of money and made money for them." Address before American Metric Association published in separate pamphlet by American Metric Association, 156 5th Avenue, New York City.

Lack of Metric Units Holds United States of America Back From First Place as Exporter:

WELLS, W. C., Chief Statistician, Pan-American Union:

"The shopkeepers cannot sell yard-wide cloth to people who are used to buying meter-wide cloth. The artisan who needs a 2½ centimeter chisel will not take an inch chisel instead. . . . Changing world trade demands a change in our customary measures. So long as we cling to inches, yards, pounds and gallons we carry a weight, a useless weight, that of itself is sufficient to hold us back from that first place as an exporter of highly wrought manufactures which is ours by right of skill, enterprise, and resources. . . . We must adopt the metric units." *Decimal Educator,* p. 150, September, 1919.

Latin American carpenters had to use lumber imported from United States of America by the foot measurement, but they built by metric units and were accustomed to the wastage owing to use of inch material. "It was a case of a right-handed man using a left-handed tool; there was a right-handed tool that would suit him better, and there was also the possibility that he might have the opportunity to buy the tool." *Decimal Educator,* p. 149, September, 1919.

"Where we sold lumber we are now selling chairs, tables, desks, and so on; where we sold pig iron we are now selling knives, plows, machinery, and so on. Where we formerly sold raw cotton we are now steadily increasing the sale of cotton wrought into the completed articles or parts of articles. Our changing world trade demands a change to metric-units—meter-liter-gram. Clinging to this old lack of system is sufficient to hold us back from first place as an exporter of highly wrought manufactures."

ARNOLD-FORSTER, H. O., Recent British Minister of War:

"Let us picture to ourselves the position in which a British commercial traveler finds himself when he goes to some country in which the metric weights and measures are used. Probably when he gets there he will find a German or a French commercial traveler trying to sell the same kind of goods. What is the customer likely to do? Will he choose to do business with the man who reckons all his quantities in tons, pounds, and ounces; in feet, yards, and inches; in gallons, quarts, and pints—measures which he does not understand, and which, if he did understand, he would find exceedingly tiresome to use. Or, will he do business with the German or the French traveler, who uses exactly the same weights and measures with which he himself is familiar; who will sell to him by the gram, or the meter, and who will be able to send orders home without changing a single figure in the instructions which he receives? Who can doubt but that the orders will go to the traveler who talks the 'trade language' which the customer understands, and not to the traveler who talks the ancient and barbarous tongue which the customer not only does not understand but will not take the trouble to try to learn?

"The picture which has been drawn is not a fancy one. Already those whose business it is to inquire into the reasons which interfere with the spread of British trade in foreign countries are well aware that the use of our weights and measures is a real disadvantage, and a disadvantage which is becoming more serious every year." *Coming of the Kilogram,* Cassell and Co., London, British Isles, 1898.

MARTIN, Major A. J., British Author and Metric Advocate:

"As long as the British continue to export goods in ordinary British Imperial denominations they must enter other countries 'subject to fines,' in the form of extra duty, for we cannot expect world Custom Houses to have a special tariff of charges made to fit in with British weights and measures. Neither can we expect British world customers to buy goods 10% smaller than other goods in their country or to learn the British awkward trade language." *One Language in Commerce,* T. Fisher Unwin, London, British Isles, 1906.

Germany Reaped Commercial Harvest From U. S. America's Neglect:

TURNER, F. W., American Educator:

"Germany adopted the metric system because of the military and commercial advantages it gave her. Is American mental laziness to be North America's worst enemy in Latin America while Germany is allowed once more to reap a commercial harvest from the fields of America's neglect?" *School Science and Mathematics,* January, 1907.

"When the question was merely one of simplicity, little importance was attached to it, but now business people have learned that our chaotic weights and measures are a serious obstacle to world trade, the matter is practical politics." *Nature,* 28 November, 1895.

"One may imagine the time and labor lost in these processes and the tendency to prevent growth of American commerce that these vexations must exert, for where other things are equal the 450,000,000 of metric potential customers naturally incline to deal with those who speak the same language of quantity as themselves [that is, metric units]." *Science,* 12 January, 1906.

Metrics Remove Chief Handicap in World Competition:

PRICE, COLONEL A. J., Recent Commander, British 2nd West Yorkshire Regiment:

Other countries have found little difficulty in the advance to metrics. "The great growth of Germany's trade practically dates from the time she used metric weights and measures." Exclusive use of metric units in 1871 removed the chief world trade handicap from which Germany suffered.

"Before an English firm can sell its goods to the world it is necessary to convert English weights and measures into metric units, and it has been said that while an English traveler is busy converting his measurements and prices into metric units, the German secures the profitable work."

Customers Prefer Metric 10% Larger Articles:

MARTIN, Major A. J., British Author and Metric Advocate:

"Customers do prefer the 10% larger articles. Often have the commercial travelers of our rivals in Europe and in distant climes advertised this fact while we slept." *Address before British Surveyors' Institution.* Pamphlet published by *The Decimal Association,* Finsbury Pavement House, E. C. 2, London, British Isles.

"The advance has been more needful to the manufacturing British Isles than to any other country."

"Other nations, adopting quicker, more accurate and simpler 'International' methods, have, therefore, diverted and are continually diverting much of the trade of which the British 30 years ago held almost the monopoly, as is evidenced by Consular Reports from all quarters of the globe. In France, for example, imports from metric-using countries have increased to the detriment of the Anglo-Saxon countries." *One Language in Commerce,* T. Fisher Unwin, London, British Isles, 1906.

Measure Handicap in Trade:

"It is always there even when the monopoly seems the most firmly established, and like a well-tempered coiled spring lies in wait to exert a full influence whenever the pressure of the other factors is released or becomes less." *Business Digest,* 12 August, 1919.

Machines Duplicated for World Trade:

ARNOLD-FORSTER, H. O., Recent British Minister of War:

"A British manufacturer when he begins to make a machine has to make up his mind what he will do. If he decides to make all his machinery for sale at home he will naturally make all his weights and measurements in British measures, but if he wants to sell some of his machinery abroad he will be in a difficulty. Either he must use his English patterns to make parts which are to be sent to countries where English weights and measures are not used or understood, or he must go to a very great expense in getting a new set of patterns, and sometimes new machinery and tools as well, so as to be able to make one kind of machine to be sold at home and in the Colonies, and another kind to be sold in foreign countries. Some engineering firms

have been wise enough and rich enough to take the last course, and to manufacture both kinds of machines; and there are a few firms who have preferred to give up the British weights and measures altogether and to make their machines according to the metric measurements. But the majority of our engineering firms still go on manufacturing all their machines according to the British fashion, trusting to the excellence of the work to insure its sale in foreign countries. We have already seen, however, that a manufacturer who trusts only to the excellency of his work is likely to be disappointed." *Coming of the Kilogram,* Cassell and Co., London, British Isles, 1898.

COLLINS, DR. JOS. V., Department of Mathematics, State Normal School, Stevens Point, Wisconsin, U. S. America:

"Only one set of measures and one set of weights are needed to measure and weigh everything, and one set of machines to make things for the world's use. There would be no duplication of costly machinery as at present to enter world trade, thus securing enormous saving." *Scientific Monthly,* December, 1915.

"Exporter after exporter has recognized the need of making use of the metric system, and has quietly begun turning out 2 classes of products if he satisfies both domestic and world trade—goods measured and marked in customary units, and others sized and marked metrically. As complicated as such a procedure might appear at first sight, it has proved distinctly profitable in practically all cases in which it has been tried, thus confuting the contention of opponents of the metric system that its use would prove expensive." *Scientific American,* 1 July, 1916.

Saving for Whole World:

NYMANS, E., For the Main Committee for Standardization in the Netherlands:

"On the day that America will sacrifice the antiquated system of measures, considerable loss of material, brain-work and time will be saved not only for its own industry, but also that of all countries that are in commercial relations with the United States of America." *Letter to World Trade Club,* 13 November, 1919.

"It would not be necessary to carry double stocks of merchandise, but simply to understand the metric units by which the stock on hand would have to be sold and bought." *Valve World,* February, 1913.

HENRIQUEZ, GEORGE, World Trade Developer, Barcelona, Spain:

"I am a great admirer of your great enterprise, and I am today sending the Britannian and American legislators a letter. I may add that in my experiences in Europe developing trade for British and American firms I find out the difficulties existing in the different weights and measures.

"I will give you one case. Spanish firm wants to buy sugar from the States, and all the quotations they get are in pounds, and the Spanish concern sells it in kilos. Well, they have to go to a great deal of trouble to convert the pounds into kilos." *Letter to World Trade Club,* 14 October, 1919.

Millions Lost Yearly in World Business:

WILSON, W. P., Director of the Philadelphia World Trade Museums:

"Millions of dollars are lost every year in transposing weights, measures and money from the system of one country to that of another in world business relations." *Science,* vol. 15, p. 829, 1902.

"The maintenance of the old and inconvenient standards, which are not the result of any logical development, but which have simply 'growed,' like the immortal Topsy, constitutes not only a present loss to ourselves, a loss in time wasted in tedious computations and a loss of the quicker grasp and keener insight bred of dealing with exact and constant quantities, but keeps up a barrier between us and the over 400,000,000 people of other countries who have been trained to think in terms of the metric system from childhood." *Nation,* 28 March, 1918.

General Advantages More Than Balance Cost:

"Apart from all other considerations, the adoption of the metric system would have the advantageous result of fostering, in those who use it, a higher level of efficiency, greater breadth of view, and a more general appreciation of economy. More than all, its adoption would deliver world trade from the archaic system of computation which is now so intolerable." *Decimal Educator,* September, 1919.

World Competition calls for World Standardization:

HOOVER, HERBERT, United States Secretary of Commerce:

"We can meet competition from Europe if we can increase the efficiency of our industrial machinery. . . . We can only hope to do this, however, if we reduce the losses in our industries and in our distribution, and I know no factor of that problem that is of more importance than **STANDARDIZATION.** . . . Standardization extends at once into the whole field of greater uniformity of dimensions." (Address before National Conference on Weights and Measures, Washington, D. C., May, 1921.)

Metrics Only Possible Universal Units:

BELL, ALEXANDER GRAHAM, Telephone Inventor:

"In my opinion, the world trade of the United States of America will be very much increased by American use of that system of weights and measures which alone has any chance of becoming universal—the metric system."

"There can be no question that in competing with metrical countries for world trade of the countries already employing metric units, American trade is seriously handicapped by the inconvenient and antiquated weights and measures. This means that we are at a disadvantage everywhere in the world excepting in dealing with Great Britain and her Commonwealths."

"The necessity for progress is very obvious—it would be advisable to adopt a system that would not only be convenient for Americans, but would also be convenient for the world with whom we wish to trade." *National Geographical Magazine,* January, 1906.

Story of the Metric Units:

"When commerce spread, the chaos of units in trading countries became intolerable. A world system was desired alike in science and commerce. An ideal system must be practical and scientific, adapted to measure anything and suited to all people, for all purposes, and for all time. Men of affairs urged that such a system be devised. The vision was realized in the metric system, now the legal standard in 36 countries and in use for scientific purposes thruout the world." *Metric Manual for Soldiers,* issued by U. S. American Bureau of Standards, Washington, D. C.

Present Units Embarrass Business Transactions:

GORE, J. H., Professor Emeritus of Mathematics, George Washington University, Washington, D. C.:

"From the reports of our consuls thruout Europe, we see that no cause, since the earliest organization of civilized society, has contributed more largely to embarrass business transactions among the members of the family of nations—especially by placing obstacles in the way of commercial exchanges between different countries, or between different provinces or between different cities—than the endless, senseless diversity of instrumentalities employed for the purpose of determining the quantities of commodities awaiting exchange." *Forum,* August, 1901.

CHAPMAN, H. L., President and General Manager of the Field Force Pump Co., Elmira, New York, United States of America:

"We have recently made shipment of a carload of spraying machinery to Brazil, South America, and found that it was very important that the measurements be in meters rather than feet and inches. We respectfully recommend the adoption of meter-liter-gram by the United States of America." *Letter to World Trade Club,* 6 August, 1919.

BEST & LLOYD, Birmingham Manufacturers, British Isles:

"We have advocated metric units for many years. We believe that had we not adopted the system years ago in connection with world trade, our world trade would have gradually ceased—instead of growing, as it did until 1914." *Decimal Educator,* p. 89, March, 1919.

LANDAU, H. L., Vice-President of Victor E. Karminski & Co., Inc., Steel Manufacturers:

"Different methods of computing weights and measures have proven a constant bug-a-boo to the man who ships his products abroad, but in the steel business, particularly where America is forced to specify in 'nearest inch equivalents' to the metric sizes required, against German and French competitors who can supply exactly what is wanted, your system of one weight, one measure and one coin will not only have a tendency to keep the World War Won, but will assist greatly in making it possible for America to maintain her hold on the World's markets.

"Steel Mills in this country will never manufacture material in metric sizes especially for the importer abroad while varied systems prevail, but if your organization can bring about a standardization of the meter-liter-gram, it will be a wonderful thing for all the world." *Letter to World Trade Club,* 16 December, 1919.

WINDER, C. D., of Winder & Dean, Merchandise Brokers and Shippers, El Paso, Texas, U. S. America:

"We welcome the opportunity of expressing our approval of your effort to establish the metric system in U. S. America as well as in Britannia. America's present antiquated system causes children many years of wasted time in learning tables of measures, which they very promptly forget upon leaving school; while in business much more time is lost in unnecessary figuring. In this business, merchandise brokerage, our quotations come to us in bushels, dozens, so on, so on. To get our delivered price we have to reduce to cwt., then add the freight rate. A large portion of the business on the Mexican border of the United States is done with Mexico, which uses the metric system and we have to do a great amount of unnecessary

figuring—sometimes making errors—to give our customers prices which they will understand.

"The Mexican Railways use the metric system and to give a customer a price at destination involves more figuring, practically all of which could be eliminated by our use of the metric system. Our system is very detrimental to good business relations with our neighbors and customers. We are of the opinion that were we to adopt the system as you suggest, good business would result with Mexico, Central and South America." *Letter to World Trade Club,* 7 June, 1919.

BELL, ALEXANDER GRAHAM, Telephone Inventor:

"It is safe to say that after the metric system has been adopted by the United States and our people have become accustomed to its use, we would no more dream of going back to the present system of weights and measures than we would think of carrying on the processes of arithmetic thru the medium of the old Roman letters in place of the Arabic numerals we now employ." *National Geographic Magazine,* January, 1906.

REDFIELD, W. C., Recent U. S. American Secretary of Commerce:

"We know, of course, that George Washington was called by his enemies the Stepfather of his country, but George Washington has become a standard for American public thot. We recognize perfectly well that one great author, one great engineer, one great artist after another is like the prophet—that is, he 'is not without honor, save in his own country,' and has, nevertheless, by the impact of truth, become in time a standard of thot and action and comparison. So, we may conclude, we need not take too seriously those who make a dismal picture of the difficulties of changing to the metric system, and object to altering darkness to light. Darkness has never found light agreeable to it, because light drives darkness out." Address before American Metric Association published in separate pamphlet by American Metric Association, 156 5th Avenue, New York City.

ADAMS, C. A., Consulting Electrical Engineer and Professor at Massachusetts Institute of Technology:

"It might almost be said that the degree of standardization in any nation is a measure of its civilization, certainly in the material or industrial sense of the word." *Journal of Electricity,* pp. 411, 412, 1 November, 1919.

Benefits Outweigh Cost:

REYNOLDS, HANS, Manufacturing Engineer, Progress Works, Manchester, British Isles:

"As head of a large engineering concern, employing over 500 men, where every part is worked to gage and standard, I am aware that a change from the English to the metric system would entail a slight expense. Great benefits, however, can only be obtained by some efforts being made, and a little faith in the great advantage which will follow should carry anyone thru a few years of inconvenience inseparable from such a change." *Valve World,* November, 1912.

BAYER, H. G., Author of "The Metric System in All Its Details":

"Progress and improvement always cost something, but it pays and repays in the end." *Metric System in All Its Details,* H. G. Bayer Co., New York City, 1912.

99% Majority Should Rule:

WADSWORTH, C. S., Middletown, Conn., United States of America:

"No important change can be made without expense and inconvenience, and these cannot always be evenly distributed. Nevertheless, those engaged in any particular business or craft have not the right to demand that the progress of the whole community, along any given line, be held back in order that they, the minority, may avoid temporary inconvenience or make more money at the expense of the majority. Let the government license those who think they would lose by the advance to metric standardization. They would soon come into line as did the Swiss watch-makers under similar conditions." *Valve World,* November, 1912.

Metrics Simple and Scientific:

STRATTON, S. W., Director of U. S. American Bureau of Standards, Department of Commerce, Washington, D. C.:

"The metric system is a simple and scientific one; it is just as practical as it is scientific. The man who makes the distinction between the scientific and the practical is making a distinction that does not exist. If there is anything that is practical it is scientific work." Decimals give a great saving whenever they are used. *Metric Congressional Hearings,* p. 287, 1906.

COLLINS, DR. JOS. V., Department of Mathematics, State Normal School, Stevens Point, Wisconsin, U. S. America:

"How hoary and moss covered our old system is can be quickly told. If another Rip Van Winkle were to awake from a sleep not of 20 but 120 years, looking around he would see nearly everything changed, as houses, landscapes, utensils, dress, customs, language, means of communications, and even religion itself. There is perhaps only one thing he would find quite the same as of yore. It would be the old measuring units. He would soon spy the old wicker bushel basket, the old gallon crock, the old wooden yard stick, and the old iron pound weight, all quite unconnected with each other, never having been born but having 'just growed,' like Topsy. Here then we see conservatism at its worst. It seems like a vast pity to have 20,000,000 children and young people spending their time learning the antiquated tables when it is not necessary and when they will remember only a small part of what they learn." *Educational Review,* October, 1916.

Anomaly of Medieval Units:

"The American people have a world-wide reputation for their ingenuity in devices to save time and labor. It is an anomaly that such a progressive people has failed to see the enormous loss of time and labor incurred in the retention of medieval and confusing weights and measures." *Science,* 12 January, 1906.

SEAMAN, W. H., American Chemist:

"Convenience and utility require the whole world to use the same weights and measures for all purposes." *Engineering and Mining Journal,* 9 February, 1905.

Tendency of Age to Standardize:

PRICE, COLONEL A. J., Recent Commander British 2d West Yorkshire Regiment:

"The day when every engineer and manufacturer wanted to design or make something different from everyone else has gone by. The confusion and waste caused by the numberless forms of steel rails, joists, belts, and

screws has led to the adoption of carefully selected types, which have been accepted as standard sizes suitable for all practical purposes, to the great convenience and economy of manufacturers and users." *Surveyor*, 6 October, 1916.

The Standardization of Standards:

During the World War the U. S. American Departments of War, Navy, and Commerce appointed representatives to act with engineering societies in securing co-ordination of effort. From this American Engineering Standards Committee was formed the American Engineering Standards Association.

"The American Engineering Standards Association will furnish a means by which any organization intending to define a standard can readily ascertain what others are interested in, and should be consulted in regard to it."

"It provides definite machinery for securing co-operation and preventing duplication of work." *Scientific American*, vol. 121, pp. 157, 168, 16 August, 1919.

KENNELLY, A. E., Electrical Expert of Massachusetts Institute of Technology:

"The same sort of thing has happened before. In this country, the dollar-cent currency has superseded the preceding pound-shilling-pence currency of colonial days. There must have been a good deal of bother and some expense involved in the change. But who denies that the advantages of our present dollar currency far outweigh the transitory disturbances and expenses of the change? Who wants to go back to the old currency?

"Again, at an earlier period, the entire European business world kept its accounts in Roman numerals. Imagine what bookkeeping must have been when an entry in the cash book might be a sale of LXV pairs of gloves at VII shillings and IX pence per pair. The histories tell us that it took about 150 years for the Arabic numerals to come into general use among merchants and business men after the astronomers and mathematicians used and recommended them.[1] Moreover, the change to the now universal Arabic notation appears to have been resisted strenuously by the merchants, who said that the expense of the change would overwhelm them. The change came. It must have cost some time, effort and money. But who doubts the advantage of the change, and who wants to go back?" *Letter to World Trade Club*, 4 March, 1920.

LEWIS, O. L., Chief Engineer Southern Motor Manufacturing Association, Ltd., Houston, Texas, U. S. America:

"The advantages to be gained are worthy of the effort, just as it was an advantage to change the style of standard threads from the old 'V' type to the U. S. S. and S. A. E. These changes involved a considerable amount of stock, tools and gages. Nevertheless, the change has been gradually accomplished, until now the old 'V' thread is practically obsolete. So it would be with the metric system.

"After the change is once made manufacturing will proceed under its normal course and 50 years from date the crude English measurements, now in use, will have been forgotten." *Letter to Fuller and Sons Manufacturing Co.*, Kalamazoo, Michigan, United States of America, 23 February, 1920.

[1] Altho the Hindu Arabic numerals 1 2 3 4 5 6 7 8 9 0, were known to humankind for centuries, it took the English Exchequer 882 years to adopt them, instead of the old "tally" method of accounting.

History Repeats Itself:

BRIGGS, E. R., Engineer for Willans & Robinson, Large Engine Works at Rugby, British Isles:

"In 1844 mechanical engineers of note had their own standards of screw threads. They had the mistaken idea that they were protecting their business. These local standards resulted in failure and chaos with extension beyond local trade. The remedy was found in standardization for national trade. Now national trade has expanded into world trade. There is a chaotic state of affairs analogous to the former confusion of local standards. It is better to take a leaf out of the past and to standardize immediately with metric units." *Electrical Engineer,* 14 October, 1904.

Recent Standardization of Screw Threads in France Comparable to Metric Advance:

GUILLAUME, C. E., Director of World Bureau of Weights and Measures at Paris, France:

"France herself has recently [1904] brot about an important reform, and one which is comparable with what the United States would have to encounter if it should adopt the metric system. As decided at an international convention, the adoption of systematic metric screw threads has become a practical realization, and no large railroad company, no large construction firm, has hesitated to incur the extra expense, knowing that they will be amply repaid in the future." *Electrical World and Engineering,* 5 November, 1904.

Standards for Flanged Cast-Iron Fittings:

1. In early days, manufacturers made patterns according to their own personal ideas for whatever sizes of flanged fittings they needed.

2. In 1894 the American Society of Mechanical Engineers and others adopted a standard. This is known as the "A. S. M. E. Standard."

3. In 1901 certain manufacturers established a standard of extra-heavy flanges. This is known as the "Manufacturers' Standard of 1901."

4. In 1912 the American Society of Mechanical Engineers and others standardized center to center and face to face dimensions of all flange fittings. This is known as the "1912 U. S. Standard." But this did not establish national uniformity. Variations in pipe fittings continued by reason of the "1912 Manufacturers' Standard."

5. In 1914 national uniformity was achieved. A compromise was embodied in the "American Standard." *Machinery's Encyclopedia,* vol. 5, p. 39, 1917.

HALLOCK, WILLIAM, Ph. D., Professor of Physics in Columbia University, and

WADE, H. T., Editor, "Physics and Applied Science," "The New International Encyclopedia":

"Conformation to standards, so necessary for successful manufacturing, does not involve the blind adherence to such standards after better standards have been evolved. That such a change in units or standards can readily be made we know from numerous instances in the past where various gages, screw threads, screws, etc., have been changed without undue confusion and expense. A notable instance, inasmuch as the change was radical and fundamental, was made by the printers of the United States in 1883, when the nomenclature of the different sizes of type was changed, and a system of measuring by points adopted to take the place of names in use for years. In fact the adoption of various screw threads in different countries, either in

the interest of standardization or to obtain a better screw, and even their modification, has worked no great hardship, and such changes in car coupling and other devices recommended from time to time in the United States by the Master Car Builders' Association, involving as they often do marked departures from sizes or styles in use by different railroads, seem to be made speedily and effectively, and without such expense as would occasion objection from controlling officials." *Evolution of Weights and Measures and the Metric System,* p. 173, Macmillan Co., 1906.

"The change to the Sellers thread in the United States was made without any paralysis of manufacturing industries or serious injury to machine work, and the same was true when the railroads adopted a standard screw thread and gage on the recommendation of a committee of the Master Car Builders' Association, which reported in 1882. This report shows the advantages to be gained by adopting and adhering to one system, and outlines the problem that was solved by the late Professor William A. Rogers and the Pratt and Whitney Co., in preparing suitable standards for adoption by all railroads. This change was made in the course of a few years without undue difficulty or expense and since has been found amply justified, illustrating most strikingly the advantages of one common standard.

"The adoption of the metric system, however, does not necessarily involve the changing of the present excellent screw system of the United States, as it is perfectly possible to get along with arbitrary names and gages based on original standards, and well defined in terms of metric as well as the old measures. Just as '10-penny' nails are now spoken of, so screws could be defined by number even if they were based on obsolete linear measures and standards. On the other hand, if the tendency should be towards a new international gage it will come gradually, and without undue inconvenience, as similar changes have been made in the past." *Evolution of Weights and Measures and the Metric System,* pp. 185, 186, Macmillan Co., 1906.

World Standardization Reconstruction Measure:

WADE, H. T., Editor, "Physics and Applied Science," "The New International Encyclopedia":

"With such world standards established, it is safe to say that a new mechanical and industrial era will dawn, and by increased efficiency and the elimination of waste, both of material, time, and effort, the world will be able to make up in part for the utter destruction of resources which the years of war have produced."

"America must appreciate the matter of world standards and contribute its important share to world standardization. It can and should compete in world markets with all comers in the matter of quality and price of product, but it should not handicap itself at the very outset by undertaking to wage a battle of standards in behalf of American ideas, preferences, or prejudices, where suitable thot and action in advance, not only could remove any such necessity, but also could provide harmony and promote efficient conditions of manufacture." *Industrial Management,* April, 1918.

Look Toward Universal Standards:

"Can we not look forward to the day when a merchant vessel of any nation can obtain bolts, screws, pipe fittings and other parts needed for replacement and repair in any port in any civilized country, made to standards identical with those which were originally built into her machinery in her home yard?"

"If under the grim necessity of war we can standardize weapons, munitions and war supplies between nations, why can we not standardize machine parts and engineering equipment for times of peace? . . . Where is the statesman-engineer who will start this program?" *Industrial Management,* August, 1917. (Undoubtedly the writer had in mind Herbert Hoover, world engineer, now United States Secretary of Commerce.)

THE PACKER, Kansas City, Mo., U. S. America:

"This system of weights and measures can be learned in a few minutes, and if it were adopted generally in the United States there would be no question as to varying weights of bushels of produce in different states as at the present time. A quantity of onions called a bushel varies from 48 to 57 pounds in different states at the present time. In other words, 100 bushels of onions in Indiana, according to the state law, are only about 85 bushels, according to the Illinois law, when shipped across the line, as 57 pounds constitute a bushel in Illinois and 48 pounds are a bushel in Indiana. Of course, when selling by weight there is no difference, but with the metric system in general use, there would be no necessity of a new standard weight and measure law. Under the present system, such a law is badly needed." (1 November, 1919.)

Need for World Standardization:

"When standards have become established in manufacture they will persist, for the demand for those sizes will continue. But it does not necessarily follow that this is a fatal obstacle to our adoption of the metric units. Pipe-tubes are a striking example because their size is nominally expressed in inches, even in Germany. But in fact the inches might just as well be called number 1½ in England or America, as when imported into France. Standard gages and standard fits will survive as long as manufacturers survive; very largely arbitrary now, they will remain arbitrary forever." Why not standardize them on metric units? *Edinburgh Review,* vol. 212, pp. 426-449, October, 1910.

CATLIN, R. M., Consulting Mining Engineer:

"Take, for example, the item of threads and screws of all sorts. On nearly every property is to be found a varied assortment. How much time and money, not to mention labor and patience, are lost, wasted absolutely without benefit to anyone, from this cause alone. No doubt each variety may be well enough in its way, but they do not mix well. It may be possible to force them into use, but they do not fit, and in some cases it may result in serious expense and trouble later on."

"Large manufacturers have found great benefit by standardizing the various parts of their products, so that similar parts may be interchangeable, and to this end invest large sums in preparing world standard gages with duplicates for shop use." *Engineering and Mining Journal,* 22 September, 1904.

KAUFMAN, E., of E. Kaufman & Co., Steel Manufacturers, New York City:

"The engineering profession in all its avenues of operation is laboring under the big disadvantage of a multiplicity of systems, and there exist in this country:

"U. S. Standard" gage,
"Brown and Sharpe" gage,
"Washburn & Moen" gage,
"The British Standard 'Stubbs'" gage,
The fractional part of an inch,
The decimal part of an inch.

"I therefore feel sure I voice the sentiment of all manufacturers of steel and iron, to say that we would welcome the adoption of the metric system of measurements and thus eliminate all the varied gages that are in practice today.

"This country is now entering largely into the export business, so consequently we should think internationally. In practically every country outside of the United States and the British Empire, the metric system obtains. Why not facilitate export business by avoiding the confusion and complication now existing caused in transposing from one system to another?" *Letter to President Woodrow Wilson,* 19 June, 1919.

World Trade Demands World Standards:

"Today, there is a distinct lack of world standards in world markets. Certain national standards have established themselves at various points, but no one can say that their hold is supreme. In the fundamental matter of screw threads, we find today the British or Whitworth thread in conflict with the United States Standard or Franklin Institute Standard, and with the World Metric Standard. In the matter of gages, railway equipment, structural steel, and in short thruout the range of materials and articles of construction, there is no special reason for any wide diversity and lack of harmony, except a natural and independent growth of the engineering industries, manufacturing these products, for the use of them is quite similar and local conditions are ceasing to predominate."

"Efficiency rather than tradition or local prejudice now prevails in engineering the world over."

BRIGGS, E. R., Engineer for Willans and Robinson, Large Engine Works at Rugby, British Isles:

"Trade is no longer local; it is no longer national, but it is international, and surely none recognize this better than American machine-tool builders. With a world trade it becomes necessary to have world units of weight and measure. As the needs of trade caused manufacturers to fix standards half a century ago, first for their local and then their national trade, so now the same need is causing the movement towards world standard units." *American Machinist,* 18 September, 1902.

Metrics Make Replacement and Repairs Easier:

BOLLES, FRANK G., U. S. American Director of Research, formerly Lt. Col. of Ordnance:

Metric units in world trade: "American exports would be greatly facilitated by metric units, as all merchants abroad must be advised of weights and measurements of shipments in metric units. Replacements and repairs would be easier for the buyer to make and this would increase the permanent popularity of American products." *Letter to W. Mortimer Crocker,* 19 November, 1919.

WADE, H. T., Editor, "Physics and Applied Science," "The New International Encyclopedia":

"Now with many and various national standards and a few attempts at world standards not at all international, one could go thru the range of machinery, products, and materials of the various nations of the world, and show a lack of harmony in sizes, types, qualities, and method of preparation and of packing. The confusion and obscurity, as well as the lack of properly organized effort rather than any intrinsic difficulties in the way of improvement, are responsible for this condition."

"Not one or 2 large Corporations alone should set standards, but the government thru its National Bureau of Standards." *Industrial Management*, April, 1918.

PRICE, COLONEL A. J., Recent Commander, British 2nd West Yorkshire Regiment:

"Cheapness and convenience can only be obtained by standardization and duplication, so that the necessary tools and parts of a machine can be obtained readily in all countries, and be interchangeable thruout the civilized world."

Metrics are the only units which approach ideal standards: they are universal, simple and correlated. *Surveyor*, 6 October, 1916.

Metrics Aid World Standardization:

COLLINS, DR. JOS. V., Department of Mathematics, State Normal School, Stevens Point, Wisconsin, United States of America:

"Now that standardization of parts in nearly all metal manufactures is an accomplished fact and its essential importance accepted, the change to metric units could easily be made gradually, intelligently and effectively." *Educational Review*, vol. 52, pp. 265, 271, October, 1916.

CATLIN, R. M., Consulting Mining Engineer:

"So great are the benefits to be derived from the adoption of metric unit standardization that it seems quite possible that the consulting mechanical engineer and other interested parties will join together in an effort to establish certain standards. Should circumstances require any special pattern, not standard, special drawings and specifications could be made as now, but in most cases standard designs would probably be used to the mutual benefit of both maker and purchaser."

Relation of World Standardization to Cost, Labor and Metrics:

"Of all the items that go to make up cost, labor is generally the greatest; in fact, labor, either directly or indirectly, seems to be 90% of the basis of values. And so it is that labor-saving devices are being eagerly sought after." *Engineering and Mining Journal*, 22 September, 1904.

Metrics Would Not Change Existing Technical Standards But Would Simplify:

REPORT OF CONGRESSIONAL COMMITTEE, United States of America:

"It should be emphasized that this measure in no way contemplates any change in existing technical standards, such as screw threads, wire gages, lumber measures and numerous others, except as manufacturers and other interests involved find it to their interest to make the change. Doubtless a change in the fundamental standards of length and mass would facilitate the simplification of such standards; but the changes would still be brot about as heretofore by the special interest involved." *Science*, vol. 15, p. 829, 1902.

Need Metric Uniformity in Workshop and Laboratory:

"Year by year, month by month and almost week by week, industries are being more and more controlled from their laboratories—and all scientific laboratories adopt the metric system. What confusion and mistakes there will ultimately be unless uniformity is here enforced!" *Nature*, 30 August, 1917.

Loss in World War:

CROWELL, BENEDICT, Assistant Secretary of War, and Director of U. S. America's Munitions During World War:

Redesigning to Metric Units Wasted Valuable Weeks and Months During The World War:

"First there came the problem of translating the plans after we received them. All French dimensions are according to the metric system. A millimeter is 1/1000th part of a meter, and a meter is 39.37 inches. An inch is approximately 0.0254 meter. Thus to translate the French plans into American factory practice involved hundreds of mathematical computations, most of them carried out to decimals of 4 or 5 places." *America's Munitions,* Report of Director of Munitions, 1917-1918 (Washington, Government Printing Office, 1919), p. 62.

Valuable Time Consumed in Translation:

"In the Spring of 1917 we bought the plans of the [155 mm.] howitzer from Schneider et Cie., and began at once the work of translating these specifications into American measurements. This work monopolized the efforts of an expert staff until October 8, 1917." *America's Munitions,* p. 76, 1917-1918.

In other words, from about March, 1917, to October, 1917, specifications had to be translated—a delay of over 6 months.

On a sample French tank which was difficult to manufacture in U. S. America: "Considerable time, too, was taken up in changing the drawings from the metric dimensions to the American dimensions, and this involved redesigning many parts." *America's Munitions,* 1917-1918. (See also statement by Major F. H. La Guardia. Consult Index.)

Metrics Aid Preparedness:

BENEDICT, A. L., Physician and Author:

"Both in its own field and as an example and incentive to other professions and trades, the medical profession can perform an important service, by furthering the world use of the metric units. This service would be of incalculable value from the peace standpoint; it would do much to avert catastrophe if we must have war. *Let us not forget that this service would be something more than facilitating measurements by substituting the advantages of decimal computations and correlated units. It would be a training in co-operative foresight to secure efficiency.*"

"But military preparedness includes a multitude of items that have nothing directly to do with killing. Nearly every fundamental science which applies to development in peace and equally to war has for some years worked in metric units. This is true of medicine, of physiology, and chemistry, and of a large number of special scientific branches which can scarcely be termed independent sciences, microscopy, pharmacology, bacteriology, serology, so on. A change of units in passing from the scientific to the 'practical' has its obvious disadvantages."

Metrics Help German Growth:

"The adoption of the metric system by Germany was one of the most important reasons for the phenomenal industrial and commercial growth, whose regrettable result has been the present war." *New York Medical Journal,* 29 April, 1916.

War a Force for World Metric Standardization:

KUNZ, DR. G. F., of Tiffany's (New York, London, Paris); President American Metric Association; World Expert:

"One notable result of the great demand for war material in this country from the European nations has been the enforced use of metric measurements in a large number of factories devoted to such manufacture. This refers not only to field guns, shells, and so on, but also to locomotives, rails, parts of bridges, many tools and pieces of machinery." *Nation,* 28 March, 1918.

ALLCOCK, HARRY, M. I. E. E., Honorary Secretary-Treasurer, Manchester and District Decimal Association, British Isles:

"War demonstrated need of greater intimacy of contact between the man of science in his laboratory and the industrialist in his workshop." *Nature,* 6 June, 1918.

Metrics Save a Minimum of ⅔ of School Year, Reduce Arithmetic ⅓:

BAYER, H. G., Author of "The Metric System in All Its Details," etc.:

"And placing ourselves on another point of view, we must consider the tremendous advantage cited by the American statistician, Alexander Summers: *'Common school arithmetics would be reduced to 2/3ds their present size, if the metric system were adopted and 2/3ds of a year of every child's school life would be saved for useful work.'"* *Metric System in All Its Details,* H. G. Bayer Co., New York City, 1912.

Retention of Present Units Wastes Millions:

KUNZ, DR. G. F., of Tiffany's (New York, London, Paris); President, American Metric Association; World Expert:

"The great saving in time and money that would accrue from a change has been worked out by Dr. J. V. Collins of Wisconsin, who believes that one effect of clinging to the old system is to keep children in school ⅔ds of a year longer than would be necessary if the logical metric system were in their education. He figures that the school taxes to cover this unnecessary expense amount to $50,000,000, to which should be added $100,000,000 for the cost incurred by parents for the children's support during this time and $75,000,000 for the loss of earnings. And it must be borne in mind that the net result is the acquisition of a bad and cumbrous system, destined to be superseded, instead of a simple, logical, and exact one destined to be the one in universal use." Consider this great loss when carried into business computation. *Nation,* 28 March, 1918.

SEAMAN, W. H., American Chemist:

Shows disagreeable struggle of expiring jumble of weights and measures given to the British by the German Hanseatic League. World metric units must conquer. Present waste in education suggests something of present loss: "The cost of teachers and the time of students expended on useless intricacies amounts to hundreds of thousands annually, to say nothing of the subsequent waste in manufacturing affairs." *Engineering and Mining Journal,* vol. 79, pp. 286, 287, 9 February, 1905.

Initial Cost Slight, Ultimate Saving Great:

WELLS, F. O., Former President of the Greenfield (Mass.) Tap, Die, Machine Tool Company, United States of America:

"As a whole the cost of advance would be very slight. The matter, to people who have not studied the situation carefully, looks like a tremendous

mountain, but the mountain fades away rapidly as we come close to it in making an investigation. The hardware and jobbers associations are considering package lots by hundreds instead of by gross.

"The saving in time in figuring is a very strong factor in favor of the change, for in these times of high labor costs, all of these things count very heavily. I find that the clerks in the stores want the decimal system. They are tired of our present method of translation and the time it takes to figure.

"So I say, keep up the educational campaign and you will find the people demanding the change instead of trying to oppose it." *Letter to World Trade Club,* 20 November, 1919.

MOLITOR, DAVID A., Consulting Engineer:

Declares that it will save at least 20% in book-keeping and calculations for a factory to introduce metrics thruout: cites case of C. E. Schmidt Co., Tanners, Detroit, United States of America. This firm was accustomed to purchase 500 different commodities which were received in various units of weight and measure. *By the exclusive adoption of metrics the firm increased its output 50% with the same working staff. A laborer does the weighing now where an expert was required before. The laborer makes fewer mistakes.* Address before American Metric Association, 27 December, 1918. See also *Decimal Educator,* p. 68, March, 1919.

Great Saving of Time, Thot and Labor:

COLLINS, DR. JOS. V., Department of Mathematics, State Normal School, Stevens Point, Wisconsin, United States of America:

"In our system a mechanic after making a complicated calculation with common fractions is as likely as not to get his results in 6ths or 9ths, etc., of an inch, whereas his rule reads to 8ths or 16ths, and he must reduce his 6ths, or 9ths to 8ths or 16ths before he can measure off his result. In the metric, results always come out in units of the scale used. The metric system measures to millimeters or to a unit a trifle larger than a 32nd of an inch. In our system one is likely to avoid the 16ths or 32nds on account of the labor of calculation." *Scientific Monthly,* vol. 1, pp. 256-263, December, 1915.

REPORT OF CONGRESSIONAL COMMITTEE, United States of America:

"The relation between the manufacture and the sale of these products is so close that any change in the system of weights and measures which will lessen the burden and expense of the counting room and office is worth the cost, considered from the standpoint of economy alone." *Science,* vol. 15, p. 829, 1902.

Saving in Daily Life:

LUNDE, T. H., President of the American Industrial Co., Chicago, United States of America:

"If we could compute the saving in pencils, paper and time in figuring alone, it would be stupendous. I was, myself, a clerk at the time [when the metric system was introduced] and it was a revelation to me, when I commenced to use the new system." *4th National Foreign Trade Convention,* 1917 proceedings.

Metrics Aid Rapid Calculation:

Decimal units promote the use of slide rules and calculating apparatus. The millimeter is used with verniers for high accuracy in the smallest dimensions. *Decimal Educator,* p. 188, December, 1919.

KENNELLY, A. E., Electrical Expert of Massachusetts Institute of Technology:

"I consider that if the transition from the present English system to the metric system is wisely conducted, the cost in labor and inconvenience of that transition will be relatively small and insignificant with respect to the advantages gained." *Valve World,* November, 1912.

Example of Labor Saved in Square Measure:

BELL, ALEXANDER GRAHAM, Telephone Inventor:

"Take the figures 1, 2, 3, 4, 5, 6: 123,456 square inches, how many square feet?

"I will not try to work it out, but you must divide this number by 144 to get the number of square feet. You will probably require paper and pencil to perform the computation; but on the metrical plan the solution is so easy that any intelligent person can arrive at the result mentally without any calculation whatever. 123,456 square centimeters is equal to 12.3456 square meters.

"Even should we forget that there are 10,000 square centimeters in a square meter, a moment's thought will enable us to recover the knowledge. The merest tyro knows that a meter consists of 100 centimeters (the name 'centimeter' itself meaning 'one-hundredth of a meter'), so that a square meter is a surface measuring 100 centimeters one way by 100 centimeters the other. 100 times 100 is 10,000, the figure 1 followed by 4 ciphers, which means that we must shift the decimal point 4 places to the left to ascertain the number of square meters." *National Geographic Magazine,* January, 1906.

"The moment metric units alone are used there is no difficulty whatsoever."

Labor Saved—Example of Decimal Coinage:

Compare U. S. American practice to British process of converting to pounds, shillings and pence: to convert 1920 cents in the British Isles they divide by 3 different ratios; in U. S. America we simply shift the decimal point.

Decimal Money Saves Drudgery:

"We already have a decimal system of money, and the American people are therefore prepared to appreciate the great saving of labor involved in pushing the decimal principle into all American methods of measurement. America would not, if we could, go back to the old British pounds, shillings, and pence of our ancesters, for America can realize thru every-day experience with dollars and cents the drudgery we are saved in all financial calculations, and therefore are prepared to appreciate, by analogy, that corresponding benefits would arise from our adoption of a decimal system in our weights and measures." *National Geographic Magazine,* January, 1906.

Metrics Save Time in Finding Volume:

TURNER, F. W., American Educator:

"Our present weights and measures wholly lack any correlation of the several parts, a thing so perfect in the metric system. Take for example the weight, dimensional and volume relations in these 2 analogous problems. A can holds 4½ pounds of water, what is the volume in quarts? The solution is obtained from the following figures:

$$\frac{4.5}{62.5} \times \frac{1728}{5875} = \text{Answer.}$$

"In order to obtain these you are forced to remember that a cubic foot of water weighs 62.5 pounds, that there are 1,728 cubic inches in a cubic foot

and 58.75 cubic inches in a quart. How would a South American get on in solving such a problem? In the metric system the corresponding problem has no mathematics at all, for the weight in kilograms is the volume in liters." *School Science and Mathematics,* January, 1907.

Metrics Correlated:

MAILLOUX, C. O., Consulting Engineer, Chairman of U. S. American Committee of the World Electro-Technical Commission:

Present Units Confused:

"The point is often brought out against the metric system that it requires some effort to learn it and to remember it. That point, it seems to me, loses its force entirely when we stop to consider the difficulties in learning the present system and in remembering it. I want to say that in my experience of many years in varied lines of scientific and engineering work I have never found any person who had the English system of weights and measures at his fingers' ends." *Metric Congressional Hearings,* p. 7, 1907.

Draftsmen Want Metric Units:

HARTIGAN, JOSEPH, Commissioner of Weights and Measures for New York City:

"A striking illustration of the adoption and use of the metric system from a practical commercial standpoint is furnished by a bridge-building company in the Pittsburgh district several years ago which was running short of structural steel. Competition tried to hold them up on prices, so they ordered from Belgium. The orders for sizes and drilling had to be given in the metric system. The draftsmen thot at first they would have a hard time of it, but *in 3 days they became so used to it they wished all their work might be in that system."* *Scientific American Supplement,* March, 1917.

Metrics Save Time and Reduce Errors:

ARNY, H. V., Ph. D., Professor of Chemistry, Columbia University, United States of America:

Experimented at Columbia University in solving problems by metrics and by the old unrelated units. Summary of results: *"The metric system is not only a tremendous time-saver, but gives in the hands of the average student more accurate results."* *Scientific Monthly,* March, 1917.

CABOT, GODFREY L., Eminent Merchant, Boston, U. S. America:

"Wherever this great improvement has gone, it has simplified the ordinary commercial transactions of daily life, minimized disputes, and given an absolute standard from which there could be no appeal and in which there was the least possible danger of error and misunderstanding." *Science,* vol. 15, p. 829, 1902.

McEACHREN, J. W., Editor of "Valve World," Crane Co., Chicago, Illinois, United States of America; Eminent Metric Author:

"We could change to the metric system, or we could use both systems, without incurring any appreciable expense at the time. My opinion, however, is that were we all using the metric system it would be much more convenient to the workmen, and our errors would be appreciably less than they are at present." *Valve World,* November, 1912.

LEHMER, D. N., University of California, Professor of Mathematics and Practical Engineer for many years:

"Saving in errors is a great advantage from the adoption of metrics."

U. S. American Confusing Units Cause Errors in World Trade:
PISANI, G. C., British Merchant formerly in Turkey:

"Our clerks cannot check them, and even if they try to do so, after spending many hours over complicated calculations they find the results they arrive at are wrong." *Decimal Educator,* p. 75, March, 1919.

British and U. S. American Waste:
MARTIN, Major A. J., British Author and Metric Advocate:

"Lord Rosebery has said, 'We, the British, are a people of enormous waste. We waste simply by not pursuing scientific methods.'

"British Town and Parish Ordnance Maps, prepared at great expense to the country, are plotted to what is really the simple International metric scale, yet no metric scale is shown upon them. A metrician knows by rapid thot, rather than by calculation, that if there have been 25 millimeters of rainfall, 250 kiloliters or tons have fallen to the hektar (his figures are 100x 100x.025). But it requires something more than mental arithmetic to find that one inch of rainfall means about 22,624 gallons, or 101 long tons, or 113 short tons to the acre. And fresh calculations would be required to find the quantity fallen on one morgen, arpent, or bigah.

"The Drapery Trade [Dry Goods] forms another striking example of time wasted. Drapers now buy much of their material in folds of a meter or fractions of a meter: the invoices are made out in yards, and must therefore be checked by measuring off the material in yards or left unchecked. It is also measured off in yards when sold or at stock-taking, which measuring would be unnecessary if the metric system were adopted, for folded in with the material from Parisian houses is generally a narrow strip of paper marked off in meters. The Parisian, too, with his keen eye to natural failings, sends his price lists into the British Isles, upon which he points out that the meter is about 10% longer than the yard.

"In the schools, too, time which could be spent in mastering other subjects is devoted to struggling with our ordinary measures and weights, which convey but little meaning to the pupils' minds. It has been estimated a British child must be kept one year longer at school than the average European child, and then leave school less prepared for the battle of life."

"Some shallow thinkers will exclaim, 'But how our race will deteriorate without mental gymnastics!' The answer to such is simple. If the lads' brains had not been destroyed with our grotesque methods, they would have had time to learn higher mathematics and the advantage of 'powers of 10.'"

"Over ½ of the food supplies sent to the British Isles arrive in metric quantities. For the purposes of statistics and retailing it must be converted into ordinary British Imperial quantities. This all adds to the cost of living." *One Language in Commerce,* printed by T. Fisher Unwin, London, British Isles, 1906.

"The school children of Germany," says the Educational Review of Columbia University, "are 2 full years ahead of the children of Britain and America."

Why is this so?

German children do not have to waste valuable time over spelling. Their spelling is natural, logical, automatic; their words are made to spell themselves. The grammar that is taught to the 90% is automatic; that is to say, no time is wasted on grammar for 90% of the German people.

But the essential difference is that, in arithmetic, the school children of Germany and other countries using metric standards do not have to spend

valuable time in memorizing a bewildering unrelated, confusing jumble of weights and measures.

What the school children of Germany have to know is simple units—meter for length, liter for bulk, gram for weight. They know these, and the meanings of 6 prefixes.

In order to use all weights and measures with ease they need only to know how to compute decimally, just as in the United States of America a child can compute with American decimal metric money of which the unit is the dollar. (See World Trade Club Book 9, Ed. 4, "A 15th-of-a-Second World.")

Metric Units to Make Great Saving

Summing up the situation as to the Cost of the metric advance, **Dr. Charles L. Parsons,** Secretary of the American Chemical Society, declared before the National Council meeting of the Chamber of Commerce of the United States (9 February, 1922): "I have no sympathy with the argument of Cost. If we followed that argument we would be riding buggies while the rest of the world would be using automobiles."

The metric units are efficient, **time-saving,** labor-saving tools; and their gradual institution in the United States of America will result in great economic profit.

Heed may well be paid to the utterance of **James H. McGraw,** President of the McGraw-Hill Company, before the Annual Convention of the Associated Business Papers, October, 1921: "**Herbert Hoover** has focused the attention of industry upon the unnecessary wastes which are sapping the vitality and reducing the productivity of our nation. . . . Of all wastes which affect our happiness and prosperity, **the waste of time and human effort** is the greatest and has the most damaging influence."

Finally, in concluding this chapter on Cost, it is appropriate to quote the cautioning words of **S. W. Stratton,** Director of the United States Bureau of Standards, at the National Conference on Weights and Measures, 26 May, 1921: "One thing let me warn you about. When you hear these statements of 'the enormous **Cost,**' and so on, don't consider them. **That is PROPAGANDA.** Never shut yourselves up to the light."

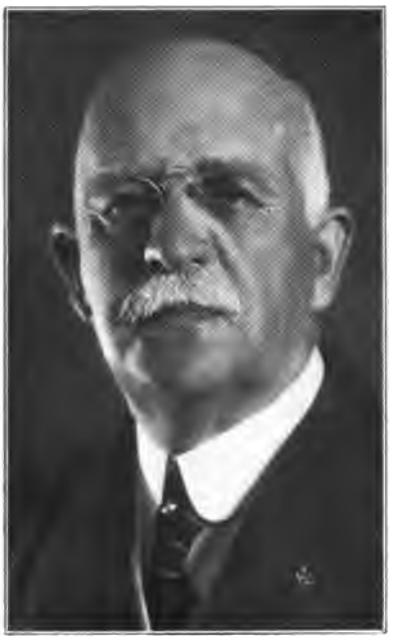
AUBREY DRURY

W. MORTIMER CROCKER

HARRY ALLCOCK, M. I. E. E.

CLIFTON HILDEBRAND

MEMBERS OF EDITORIAL COMMITTEE
WORLD METRIC STANDARDIZATION COUNCIL



GEORGE P. BLOW

C. E. GUILLAUME

ARTHUR E. KENNELLY

© *Western Newspaper Union*

GENERAL J. J. PERSHING

4 LEADERS IN THE METRIC ADVANCE

CHAPTER 11

THE METRIC MOVEMENT THRUOUT BRITANNIA

THE steady trend toward metric standardization thruout the British Isles, and all British territories, is typified by the action of the 9th Congress of the Chambers of Commerce of the British Empire, held in Toronto, Canada, in September, 1920. That great convention by overwhelming majority voted for the adoption of the metric units by all British lands, at the same time urging that the United States of America also standardize on the world units[1].

In view of this decisive declaration, there is no doubt that British commercial interests everywhere favor world metric standardization. This progressive attitude of British business men is having its effect on public opinion, and today there is a growing metric sentiment amongst all groups of the population. It is confidently predicted that within a short time the British Parliament, and the legislative bodies of the British Commonwealths, will enact legislation providing for the gradual establishment of the decimal metric units for exclusive use within their jurisdictions.

In earlier chapters of this book, it has been pointed out that the fact that the British do not today share with other peoples the benefits of world metric standardization is due mainly to faulty co-ordination between the various legislative and executive departments of Government[2]. At several periods of British history, concerted action would have carried the metric units into exclusive use as the sole legal standards. At the outset of the development of the metric plan, it was the idea of a truly great Briton, James Watt, which was utilized. His own countrymen failed to appreciate the tremendous importance of his invention, and the German king who sat on the British throne stubbornly refused to have British representatives participate in the conference of nations which perfected and standardized the world metric units. Had the British sent an envoy there, perhaps today the British yard would be the standard world yard, or meter.

---

[1] The Chambers of Commerce of ALL the British Commonwealths, assembled in convention, in 1920 REITERATED their advocacy of the world metric units. This progressive stand had been taken previously in several notable conventions. (See page 42, 358, 360.) It should be emphasized that these great world gatherings urged the metric advance for COMMERCE only—others to make the metric advance as, when, if and how they please. For world commerce, it was resolved, the yard shall be advanced to the meter, the quart to the liter, and the pound to the 500 grams. By use of these 3 units—meter, liter, gram—thruout world commerce there is achieved a uniform world language of quantity.

[2] See page 22.

Despite their self-imposed isolation, the British could not remain oblivious to the rapid spread of the metric system over the entire continent of Europe. As enterprising world traders, they came into contact with the metric system thruout the world. Insistently the issue of world metric standardization grew. In 1862 a Parliamentary committee of pre-eminent Britons was appointed, and after the most comprehensive hearings ever held, reported unanimously in favor of the world metric system. That epoch-marking report is issued as Chapter 12 of this volume.

Other Nations Act as Britain Lags

Action on this report was deferred in the British Isles. Yet it was closely noted by Britain's competitors and military enemies. In the Congress of the United States this Parliamentary report was presented in full, and led to the American metric system law of 1866. Germany, too, appointed a technical commission to look into this vital improvement. The Germans utilized the genius of the British inventor, James Watt; they utilized the labors of the British Parliamentary committee. It was decided that Germany should make the world metric units the exclusive standards forthwith.

In 1871 two events of vast world importance occurred: Germany adopted the metric system; Britain did not adopt the metric system. Years later, in the World War, that lack of vision and initiative caused the British the needless loss of many thousands of lives and untold treasure, because they were immensely hampered and handicapped thru not having metric standardization with the French and their other allies from the outset. Germany gained tremendous military efficiency thru complete metric standardization. The record of Britain's failure is thus set forth by the *Encyclopedia Britannica:* "In 1871, a bill for compulsory adoption of the metric system was rejected by the British House of Commons on the second reading by a majority of 5." For want of 5 votes, world standardization was lost; for want of world metric standardization, many a battle was lost—and the lives of thousands, tens of thousands, hundreds of thousands, lost.

British Parliament and Meter-Liter-Gram

It has been charged that after 1871 German world propaganda sought to keep the British and Americans unstandardized.[1] Yet discussion of such a vital issue as the metric system could not be ruthlessly quelled. Several British Parliamentary committees reported in favor of meter-liter-gram. The strength of the underlying sentiment was disclosed in 1897, when the metric system was made legal for all purposes by the British Parliament. In 1900 there were 96 mem-

[1] See page 152, and following.

bers of Parliament in favor of a metric bill providing for "exclusive use;" in 1902 there were 290; in 1906, the metric votes had increased to 414, and in 1907 the bill lacked only a few votes of passing. The British House of Lords in 1904 passed a bill to make the metric units used exclusively in commerce. Lord Lansdowne, on behalf of the Government supported the measure; but it failed by a close vote in the House of Commons.

The World War of 1914-18 demonstrated the superiority of metric unit standardization and the absolute necessity for world standardization. The keen trade competition following the World War emphasized even more clearly the vital need for world-known units. Britons by the millions had actual experience in use of the metric units in warfare, in munitions manufacture, and in many fields of commerce. A concerted movement developed therefore, thruout Britannia and thruout the world, to arouse the British Parliament from its inactivity on this world issue. Thousands of petitions have poured in to the British Premier, to the British Board of Trade, and the Committees on Coinage, Weights and Measures of the Houses of Parliament. It is estimated that in the years 1914-22, more than 100,000 such petitions have been sent to Parliament. It is an interesting fact to note that shoals of these petitions, when received, were destroyed by the Secretary of the British Empire's Premier, and so an accurate count cannot be made.

British Decimal Association

The metric movement in the British Isles has been co-ordinated and made effective by The Decimal Association, with headquarters at 229-231 Finsbury Pavement House, E. C. 2, London, British Isles; and with affiliated Decimal Associations in Manchester, Glasgow and other centers. The Decimal Association has worked in behalf of decimal coinage for the British Isles, as well as the decimal metric system of weights and measures. It has co-operated closely with the World Metric Standardization Council, and with the American Metric Association. The address of Harry Allcock, representing the British Commonwealths, before the World Metric Standardization Conference (read by Sir Frank Popham Young) is reproduced on pages 132 to 135; and the same expert's analysis of "Industrial Reconstruction and the Metric System" is to be found in Chapter 13.

The World Metric Standardization Council has as Executive Representatives in the British Isles, G. E. M. Johnson, London, and Harry Allcock, M. I. E. E., Manchester; in Canada, Leon Lorrain, Secretary of the Chamber of Commerce, Montreal; and numerous correspondents in Australia, New Zealand, Union of South Africa, India, and other British countries.

In conjunction with the World Metric Standardization Council and the World Trade Club, the British Decimal Association in 1920 issued a comprehensive British edition of the booklet, "Who Urges Meter-Liter-Gram?" Much of the material in the present chapter is taken from that issue. The Decimal Association has published hundreds of useful leaflets, pamphlets and reports, and some of these will be found listed and described in Chapter 14, "Look It Up," together with index to some British official reports on the metric system. The Decimal Association issues a most valuable magazine, "The Decimal Educator."

The officers of The Decimal Association (1922) are: Theodore McKenna, Chairman; G. E. M. Johnson, Honorary Secretary; E. Merry, Assistant Secretary. The Executive Committee consists of Theodore McKenna (Chairman), Harry Allcock, A. H. Allen, E. C. Barton, R. D. Blumenfeld, Sir Woodman Burbidge, Lt.-Col. E. Kitson Clark, Alex. Duckham, C. W. Edkins, A. Faulkner, R. H. Foa, Sir Gilbert F. Garnsey, W. Crosier Hayne, Hugo Hirst, O. V. G. Hoare, A. Barton Kent, Sir Hedley F. Le Bas, W. L. Madgen, A. J. Martin, Sir Guilford L. Molesworth, A. J. Naughton, J. R. Quilter, E. M. Rodocanachi, G. Russell, S. J. Sandle, David Scott, H. D. Searles-Wood, Sir Napier Shaw, G. D. Shepherd, A. J. Stubbs, C. Turnbull, Gilbert C. Vyle, C. O. Webb and Edmund White. The Decimal Association has many eminent collaborators, and lost one of its most distinguished members in its recent President, Lord Belhaven and Stenton. Thousands of concerns, organizations and individuals thruout the British Commonwealths are co-operating with The Decimal Association. The membership, subscribers and collaborators include such names as Sir John Lubbock (Lord Avebury), Lord Northcliffe, Sir Samuel Montagu, Sir Oliver Lodge, F. Henry Royce (of Rolls-Royce), Albert Herbert, Lord Kelvin, Sir Edward Holden, Sir H. Rider Haggard, Sir Horace Plunkett, Sir Donald MacAlister, Sir John Pilter, Lord Blyth, Sir James Dewar, T. Smethurst (recent Lord Mayor of Manchester), and many other eminent names.

All Britannia Urges Metric Advance

Thruout all British lands there is an insistent demand for world metric standardization. The Parliaments of Australia, New Zealand and Cape Colony have petitioned the "Home Government" to adopt the metric system, and the Premiers of all the self-governing commonwealths have several times urged this advance for all Britannia, as will be seen in following pages. The Canadian Privy Council has expressed its willingness to introduce legislation to make exclusive the metric units at such time as may be agreed upon by the various British Commonwealths; but it should be noted that Canada did not wait

for the others to advance to decimal coinage, and no doubt will adopt the metric units whenever the United States makes the advance. In fact, it is generally acknowledged that whether the British or the Americans first make the metric advance, the other group must inevitably follow.

Metric units are now extensively used thruout Britannia. The colonies of Malta, Mauritius and Seychelles have placed metric units in exclusive use. Egypt, too, utilizes metric units very extensively and has decimal coinage. Proximity to countries where the metric system is the sole standard make the meter, liter and gram increasingly familiar in such territories as British Honduras, British Guiana, Falkland Islands, all the British West Indies, Cyprus, Gibraltar, the British African states, and the East Indies. The mandate territories formerly under German rule have long employed the metric units. The French-reading population of Canada and the Dutch-reading population of South Africa are, thru their education in those languages, familiar with the metric units, which are used by France and the Netherlands. When, in addition to all this, it is remembered that decimal currency is now employed by many of the British commonwealths and states, it is apparent that the transition to the metric system thruout Britannia will be comparatively easy.

Metric Units in India

India is the country where the Hindu-Arabic system of numerical notation originated—the plan on which the decimal metric system of weights and measures is based. India employs metric units to a very considerable extent, but that vast country has been held back from thoro world standardization thru a short-sighted policy. In 1870 an Act was passed establishing the metric units thruout India, but was vetoed at London by an ultra-conservative Secretary of State for India. Another metric unit Act was passed by the Governor-General of India in Council in 1871, but has never been "gazetted" and thus has never been brought into operation. The Imperial government is therefore responsible for holding India back from exclusive use of metric standards. Nevertheless, there has been progress toward uniformity on the basis of the standard "seer" of India, which is 1000 grams in weight—the seer of water being the liter exactly. In India, fully 50% of the railways are "meter-gage," so that many of the natives already are familiar with the metric unit of length, which is used much in the textiles and other industries. The subject of metric standardization was considered by a Weights and Measures Committee for India, appointed in 1913, and the evidence was overwhelming in favor of the world uniform metric units.

Widespread Metric Advocacy

Thruout Britannia, the metric advance is urged by Colonial Conferences, Colonial Parliaments, chambers of commerce, trades unions and councils, county councils and town councils, educational authorities, National Union of Teachers, scientific societies, the Incorporated Society of Inspectors of Weights and Measures, the institutions of the professions, agricultural associations, manufacturers' associations, trade associations, thousands of commercial and industrial concerns, and influential individuals. In the following pages, some of this support is marshaled for review. It is not the aim to give all the names; some of those most representative are presented.[1]

Here is the testimony:

Metric Standardization Resolution Adopted by the **9th Congress of the Chambers of Commerce of the British Empire,** September, 1920: "Resolved, That this Congress of Chambers of Commerce of the British Empire in meeting duly assembled at Toronto, 18th to 23rd September, 1920, urges world uniformity of units of weights and measures as a means of facilitating commerce through co-ordination, standardization and simplification, and further that the British Empire and the United States of America forthwith standardize on the metric system solely."

8th Congress of Chambers of Commerce of the British Empire (1912): "Resolved, That whereas, with the progress of industry and the development of trade throughout the world, the establishment of uniform systems of weights, measures and currency becomes more and more desirable and necessary, therefore be it resolved that this 8th Congress of Chambers of Commerce of the British Empire recommends that the British Imperial Council of Commerce be requested to take steps to bring this question before the Imperial Trade Commission which is now about to sit."

House of Representatives, Australia (4 August, 1910) carried the following resolution by 36 votes to 2: "That as the adoption of the decimal systems of moneys, weights and measures would be a great national reform, shortening the labor of computation in the operations of science, industry, commerce and Government, and giving a more effective education of children at a lower cost, the government should seek the approval of the next Imperial Conference to such a reform of the British Systems as would give a common decimal money, weights and measures to the Empire, and failing this, that the Commonwealth should proceed to the consideration of such a reform in Australia, and invite the co-operation of the Dominion of New Zealand therein."

[1] Address is in all cases British Isles, unless otherwise stated.

Both Houses of Australia and New Zealand passed motions similar to the above and forwarded them to the Secretary of State.

Government of the Dominion of New Zealand (an Act to consolidate and amend the Law relating to weights and measures): "It shall be lawful for the Governor at any time, by Proclamation, to declare that from and after a date named in the Proclamation, being not sooner than the first day of January, 1906, the **Metric System,** as described in the Second Schedule hereto, shall be the only system of weights and measures recognized for use in New Zealand, and thereafter it shall not be lawful to use any weights and measures other than those described in the said Second Schedule."

Union of South Africa: In 1912, a Bill to consolidate and amend the laws of the Union of South Africa regarding weights and measures, was introduced in the House of Assembly by the Minister of Commerce and Industries. In the Schedules detailing the weights and measures to be permitted for use in the Union, the standards mentioned were metric only, though the English equivalents were also given. Pressure of other business prevented the Bill going forward for second reading, but it appears to have been regarded with favor generally. It, however, remains on record as a manifestation of the attitude of the Union Government towards the metric weights and measures.

International Parliamentary Commercial Conference (Rome, 1917) representing Parliaments of the Allied Nations: "Whereas this system is the most practical and the most used and its universal adoption would facilitate International Commercial relations;

"Whereas the nations who have not yet made it compulsory have a particular interest in its adoption, and especially Great Britain, Russia and Japan would benefit in the development of their International trade;

"Whereas the British Delegation has expressed a favorable opinion of such a reform;

"Urges that the Committees represented at the Conference undertake an active propaganda in their own Parliaments with a view to rendering exclusive the use of the Decimal Metric System of weights and measures, and that such unanimous Resolution be communicated to the British, Japanese and Russian Governments." (Note that Japan and Russia have both adopted the metric system.)

Conference of Prime Ministers of Self-Governing Colonies of Great Britain, London (1902) passed the following resolution: "That it is advisable to adopt the metric system of weights and measures for use within the Empire, and the Prime Ministers urge the Governments represented at this Conference to give consideration to the question of its early adoption."

[illegible] Commerce (Dublin, 1916):
[illegible] with foreign countries,
[illegible] steps to introduce the
[illegible] after the war."
[illegible] moned by King George.
[illegible] Sir Edgar Vincent, K. C. M.
[illegible] Sir H. Rider Haggard, Tom
[illegible] Great Britain; Sir George
[illegible] Australia; Hon. John Robt. Sin-
[illegible] Bowring, Newfoundland.

[illegible] the subject of currency and
[illegible] rence of 1911, and have also
[illegible] of the Decimal Association.
[illegible] as to the desirability of intro-
[illegible] sures, as well as a new style of
[illegible] m.

[illegible] se systems are recognized; the
[illegible] angements, both in the United
[illegible] minions, are such that few would
[illegible]

[illegible] zing this, have passed resolu-
[illegible] ssive legislation, in favor of the
[illegible] re is clearly in the Dominions a
[illegible] r of this change. So far, how-
[illegible] munity in the Mother Country to
[illegible] ailing.
[illegible] rmination of the War will bring
[illegible] for securing this much-needed
[illegible] our Majesty's Government, and
[illegible] Dominions, should then co-operate
[illegible] ure a uniform coinage based on the
[illegible] weights and measures based on the

[illegible] Commerce, representing Chambers
[illegible] Commonwealths (June, 1916):
[illegible] Council of Commerce be re-
[illegible] l and Dominion Govern-
[illegible] ort to bring about the
[illegible] orm Decimal System of
[illegible] hat trade relations with
[illegible] tended."
[illegible] mmerce (March, 1917):
[illegible] the Executive Council

[illegible] Commerce
[illegible]
[illegible]
[illegible]

to arrange for the introduction of a Bill to substitute the Metric System for the present system of weights and measures, and strongly urges His Majesty's Government to pass a measure during the present Session, and to bring it into operation at the earliest date convenient to all concerned.

"The Association also urges upon His Majesty's Government the desirability of making representations to the Governments of Canada, Australia and South Africa, that it would assist the trade of the Empire if legislation on the same lines were adopted by them concurrently with its adoption in this country.

"That His Majesty's Government be requested to call the attention of the representatives of the Overseas Dominions at the forthcoming Conference in London to this subject.

"Further, that in the opinion of this Association, **enquiries should be addressed by His Majesty's Government to the Governments of Russia and the United States, with a view to ascertaining whether they can bring about the adoption of the Metric System of weights and measures, so that the system of weights and measures may be uniform in all the civilized countries of the world.**" (Note that Russia has now completely adopted the metric system.)

Conference of Scientific Societies and Commercial Bodies of South Africa (Johannesburg, April, 1917) passed unanimously: "That the Metric System of weights and measures be legalised at as early a date as possible for permissive use until the end of the war and that its use become exclusive after such time as may be found practicable."

The following scientific societies and commercial bodies were represented by delegates present at this Conference:—

South African Association for the Advancement of Science.
South African Institution of Engineers.
South African Institution of Electrical Engineers.
Chemical, Metallurgical and Mining Society of South Africa.
Geological Society of South Africa.
Institute of Land Surveyors.
Association of Mine Managers.
South African Association of Analytical Chemists.
Natal Society for the Advancement of Science.
Biological Society, Pretoria.
Rhodesian Scientific Association.
Association of Cert. Mechanical Engineers.
Pharmaceutical Society.
Witwatersrand Agricultural Society.
Witwatersrand Central School Board.
South African Society of Civil Engineers.
Natal Manufacturers' Association.
South African Manufacturers' Association, Cape Town.
South African National Union, Johannesburg.

Conference of Irish Chambers of Commerce (Dublin, 1916): "Resolved, That in order to facilitate trading with foreign countries, the Government should be urged to take steps to introduce the Decimal and Metric Systems immediately after the war."

Dominions Royal Commission, summoned by King George. Sessions held in London. Members: **Sir Edgar Vincent, K. C. M. G., Chairman; Sir Alfred Bateman, Sir H. Rider Haggard, Tom Garnet, Wm. Lorimer, Joseph Tatlow, Great Britain; Sir George Foster, Canada; Donald Campbell, Australia; Hon. John Robt. Sinclair, New Zealand; Hon. Edgar Rennie Bowring, Newfoundland.** In final report, March, 1917:

"We have studied the discussion on the subject of currency and coinage laws at the Imperial Conference of 1911, and have also heard evidence from the representatives of the Decimal Association, and from witnesses in the Dominions, as to the desirability of introducing metrical weights and measures, as well as a new style of coinage based on the decimal system.

"The general advantages of these systems are recognized; the complications of the present arrangements, both in the United Kingdom and in several of the Dominions, are such that few would undertake to defend their principles.

"Many of the Dominions, recognizing this, have passed resolutions in Parliament, or even permissive legislation, in favor of the Decimal and Metric Systems. There is clearly in the Dominions a considerable body of opinion in favor of this change. So far, however, all efforts to induce the community in the Mother Country to agree to a change have proved unavailing.

"We are of opinion that the termination of the War will bring with it an unequalled opportunity for securing this much-needed reform, and **we recommend that your Majesty's Government, and the Governments of the Overseas Dominions, should then co-operate to establish throughout the Empire a uniform coinage based on the Decimal System, and uniform weights and measures based on the Metric System."**

British Imperial Council of Commerce, representing Chambers of Commerce of all the British Commonwealths (June, 1916): "Resolved, That the British Imperial Council of Commerce be requested by representations to the Imperial and Dominion Governments and otherwise, to **make every effort to bring about the adoption throughout the Empire of a uniform Decimal System of weights, measures and currency in order that trade relations with foreign countries may be developed and extended."**

Association of British Chambers of Commerce (March, 1917): "Resolved, That this Association requests the Executive Council

to arrange for the introduction of a Bill to substitute the Metric System for the present system of weights and measures, and strongly urges His Majesty's Government to pass a measure during the present Session, and to bring it into operation at the earliest date convenient to all concerned.

"The Association also urges upon His Majesty's Government the desirability of making representations to the Governments of Canada, Australia and South Africa, that it would assist the trade of the Empire if legislation on the same lines were adopted by them concurrently with its adoption in this country.

"That His Majesty's Government be requested to call the attention of the representatives of the Overseas Dominions at the forthcoming Conference in London to this subject.

"Further, that in the opinion of this Association, **enquiries should be addressed by His Majesty's Government to the Governments of Russia and the United States, with a view to ascertaining whether they can bring about the adoption of the Metric System of weights and measures, so that the system of weights and measures may be uniform in all the civilized countries of the world.**" (Note that Russia has now completely adopted the metric system.)

Conference of Scientific Societies and Commercial Bodies of South Africa (Johannesburg, April, 1917) passed unanimously: "That the Metric System of weights and measures be legalised at as early a date as possible for permissive use until the end of the war and that its use become exclusive after such time as may be found practicable."

The following scientific societies and commercial bodies were represented by delegates present at this Conference:—

South African Association for the Advancement of Science.
South African Institution of Engineers.
South African Institution of Electrical Engineers.
Chemical, Metallurgical and Mining Society of South Africa.
Geological Society of South Africa.
Institute of Land Surveyors.
Association of Mine Managers.
South African Association of Analytical Chemists.
Natal Society for the Advancement of Science.
Biological Society, Pretoria.
Rhodesian Scientific Association.
Association of Cert. Mechanical Engineers.
Pharmaceutical Society.
Witwatersrand Agricultural Society.
Witwatersrand Central School Board.
South African Society of Civil Engineers.
Natal Manufacturers' Association.
South African Manufacturers' Association, Cape Town.
South African National Union, Johannesburg.

Central Committee of Industrial Research.
Royal Society of South Africa.
Cape Institute of Architects.
Transvaal Teachers' Association.
Johannesburg Municipal Officials.
Witwatersrand Council of Education.
Transvaal Society of Accountants.
Institute of Bankers.
Society of Architects.
Institute of Architects.
Association of Architects.
Federation of Master Builders.
Transvaal Manufacturers' Association.
Association of Chambers of Commerce of South Africa.
Transvaal Chamber of Mines.

Trades Union Congress (September, 1920): "Resolved, That this Congress is of opinion that, in view of the changes that must inevitably take place in trade and commerce following the war, and the probable new markets abroad that may be opened, it is essential that the Metric System be adopted by this country [British Isles]."

Trades Union Congress (Glasgow, September, 1892) at which 495 delegates were present, representing nearly a million and a quarter of members, resolved: "That in the opinion of this Congress it is highly desirable in the interests of the workers and of the general trade of the country that the decimal metrical system of weights and measures shall be adopted in Great Britain and Ireland as a national system, and that a Parliamentary Committee be instructed to promote legislation on the question." A similar resolution was passed at the Belfast Congress in 1893.

National Chamber of Trade (representing over 100,000 British retail traders, May, 1920): "Resolved, That this Chamber re-affirms its belief in the desirability of changing our weights and measures to the Metric System on the ground of efficiency and economy, and for the purposes of our foreign trade." In April, 1918, it was "Resolved, That this Chamber deplores the delay in the adoption in this country of the metric system of weights and measures with a decimal coinage."

Incorporated Association of Headmasters in British Secondary Schools (January, 1917): "Resolved, That it is of the highest importance to the welfare of this country that the Metric System of weights and measures be adopted, and this Association approves the policy and aims of the Decimal Association, and invites its members to give that Association their support."

British Institute of Bankers, Report of the Committee appointed to inquire into the adoption of a Decimal Coinage and the Metric System of Weights and Measures (2 May, 1917): "Your Committee are of the opinion that the existing system of weights and measures in this country is an obstacle in the way of the extension of our foreign trade, and more especially of our export trade. This is, indeed, one of the main considerations which has influenced your Committee in recommending the adoption of a decimal coinage, as they hope that it may be the first step towards the introduction of the metric system of weights and measures into this country."

(United Kingdom) Commercial Travellers' Conference (4 April, 1920) passed a resolution urging upon the Government the desirability of adopting

the Metric System of coinage, weights and measures in unison with that of other nations.

Court of Common Council of the City of London (unanimously, 1916): "Resolved, That in view of the great advantages which would accrue to British commerce in foreign markets by the use of the Decimal System of coinage and weights and measures, it is desirable that steps should be taken to ensure its immediate adoption."

County Councils' Association and 367 British Town and County Councils: "Resolved, That it is desirable in the interests of education, commerce, manufacture and trade, that the Decimal System of coinage and weights and measures be as speedily as possible brought into general use in the United Kingdom, and with this end in view, that the system should be introduced into the curricula of the various schools as a necessary part of arithmetic."

Mayor of Chester, England (21 May, 1919): "The Council of this City at their meeting on the 26th February last, on the consideration of a communication received from the Royal Commission on Decimal Coinage passed resolutions stating:

"1. That they were in favor of a decimal system of coinage based on the plan adopted by the Latin Union being introduced for use in the United Kingdom and elsewhere, where the British currency is in use, and

"2. That they were in favor of the introduction of the metric system of weights and measures."

Lord Mayor of Manchester, representing one of Britannia's most important industrial cities, is President of the Manchester and District Decimal Association, whose purpose is meter-liter-gram legislation.

Francis Askew, J. P., P. P., Ex-Lord Mayor of Hull, Chief Secretary of the United Ancient Order of Druids, British Isles (7 August, 1919): "I have read with deep interest the World Trade Club's instructive pamphlet, and have also for a long time been interested in, and an advocate of, the adoption in this country and indeed by the whole world of the Decimal System Coinage, Weights and Measures. I sincerely trust and express on behalf of my Directors the earnest wish that the project is within very short distance of meeting with success both in the United States of America and in Great Britain."

Shipbuilding Employers' Federation (March, 1920): "Resolved, That in the interest of our home and overseas trade it is highly desirable that decimal coinage and the Metric System of weights and measures be introduced and put into operation after a reasonable interval to prepare for the change."

Provincial Electric Supply Committee of the United Kingdom (April, 1920): "Resolved, That in the interests of our home and overseas trade, it is highly desirable that decimal coinage and the Metric System of weights and measures be introduced and put into operation after a reasonable interval to prepare for the change."

London Teachers' Association: "Resolved, That the efforts of this Association to obtain the adoption of the Decimal System of currency, weights and measures should become a part of a continuous policy, and that ways and means be devised of educating public opinion on the question, as well as of bringing pressure to bear upon the Government in the matter."

Aldwych Club (London, 1916, unanimously): "Resolved, That now is the time to take steps to secure business in new foreign markets, and that

one important step is the immediate adoption of a Decimal System of coinage and of the Metric System of weights and measures."

Manchester Rotary Club: "Resolved, That it is necessary in the interests of commerce that the Metric System of weights and measures should be adopted in the British Isles."

Leeds Rotary Club: In 1916 passed a resolution in favor of the adoption of the Metric System.

Belfast Rotary Club (unanimously, 1916): "It is the opinion of this Club that the Government should be urged to adopt the Metric System."

Cardiff Business Club (January, 1918): "Resolved, That in view of the great advantages which would accrue to British commerce in foreign markets by the use of the Decimal System of coinage and weights and measures, it is desirable that steps should be taken to ensure its immediate adoption, so that it may be already in operation at the conclusion of the war."

Halifax Business Club (January, 1917): "Resolved, That the Government be asked to introduce immediately Decimal coinage and the Metric System of weights and measures, as one of the most important steps to be taken for the expansion of our trade and commerce needed after the war."

Yorkshire Dyers' Federation (March, 1920): "Resolved, That in the interests of our home and overseas trade, it is highly desirable that Decimal coinage and the Metric System of weights and measures be introduced and put into operation after a reasonable interval to prepare for the change."

Incorporated Federated Associations of Boot and Shoe Manufacturers of Great Britain and Ireland (February, 1920): "Resolved, That this Federation approves the introduction of a national standard of coinage and weights and measures based on the Decimal System, and that such a system would, in the opinion of this industry, facilitate its commerce both at home and overseas."

Bradford Textile Society (November, 1913): "Resolved, That this meeting views with favour the adoption of the metric weights and measures in this country after an ample period of time to prepare for the change, and urges the Bradford Textile Society and other trade organizations to work for the reform."

Silk Association of Great Britain and Ireland (October, 1918): "Resolved, That while approving the decimalising of the coinage of the United Kingdom, this Council is of opinion that it is desirable that the Metric System of weights and measures should be adopted by the nation."

United Tanners' Federation of Great Britain and Ireland (Representing 95% of the leather producing trade) (June, 1919): "It was agreed that for the benefit of the Trade as a whole the Decimal System should be adopted, and that in the opinion of this Committee the Decimal System of weights, measures and coinage should be adopted in the Trade throughout the Empire."

Asbestos Association Limited (London, March, 1920): "Resolved, That in the interests of our home and overseas trade, it is highly desirable that Decimal coinage and the Metric System of weights and measures be introduced and put into operation after a reasonable interval to prepare for the change."

British Horological Institute (1915): "Resolved, That the general and immediate adoption of the Metric System would be a valuable means of

assisting British firms in their competition in countries where that system is in vogue, and that representations be made to the Government with that object."

Far Eastern Section of the London Chamber of Commerce (1913): "Resolved, That the Far Eastern Section approves of the adoption of the Metric System of weights and measures and currency as recommended by the Council of the Chamber and the Congress of Chambers of Commerce of the British Empire."

High Conductivity Copper Association (London, March, 1920): "Resolved, That this Association is strongly in favor of adoption in this country of a Decimal System of coinage and weights and measures. It desires further to state that, in the manufacture of wire, with which it is particularly concerned, a Decimal System, based on the inch, is largely used, and that a change to the Metric System would not present difficulties."

Midlands Granite Quarrymasters' Association (March, 1920): "Resolved, That in the interests of our home and overseas trade, it is highly desirable that Decimal coinage and the Metric System of weights and measures be introduced and put into operation after a reasonable interval to prepare for the change."

National Co-operative Men's Guild (April, 1920): "Resolved, That this meeting of the Co-operative Men's Guild approves a uniform system of weights and coinage for International use and, to encourage International Co-operation, Guild Branches should petition Parliament and local M. P.'s for the immediate adoption of the Metric or Decimal System."

Plymouth Mercantile Association (unanimously, at a meeting in 1917): "Resolved, That the Government be asked to introduce immediately the Decimal coinage and the Metric System of weights and measures as one of the most important steps to be taken for trade and commerce after the war."

British Society of the Argentine Republic (1915): "Resolved, That in the interests of British commerce the Board of Trade be respectfully requested to consider the advisability of introducing the Decimal and Metrical Systems, believing that the adoption of such systems will enable British manufacturers to compete much more favourably than they otherwise can do with their rivals in all foreign, and especially Latin-American markets."

British Chamber of Commerce in Argentine, South America, in its annual report (1918) states that it has sent a memorial to the British Prime Minister advocating the adoption of a decimal coinage and of the metric system of weights and measures as the official and legal standard in all British transactions.

Retail Merchants' Association of Canada, Saskatoon, Canada (26 May, 1920): "The purpose of this Association, besides serving the immediate needs of all retail merchants who are connected with it, is to investigate all matters and methods which might prove of service to its members. We feel that a change from our present system of weights and measures to the metric system would be of great benefit."

Canadian National Council of Women (1919 Convention) has endorsed the adoption of metric units, recommending that they should be taught in the public schools.

Ottawa Local Council of Women, Frances A. Rowatt, Corresponding Secretary, Ottawa, Canada (9 October, 1919): "I have sent a note of endorse-

ment of the metric system to Premier Lloyd George and the President of the United States from the Ottawa Local Council of Women."

Provincial Association of Protestant Teachers of Quebec, Quebec, Canada, thru A. Norris, Convener of the Metric System Committee (2 November, 1919): "The Association at its recent Convention, held in October and attended by nearly a thousand teachers passed a resolution to memorialize the Imperial, Federal and United States governments in favor of the adoption of the metric system exclusively." (This association has done splendid work in behalf of the metric system.)

Alex G. Baillie, Secretary, Association for the Protection of Canadian Coastwise Shipping and Seamen, Port Hastings, Cape Breton, Canada (5 June, 1919): "We are heartily in accord. It is too long the United States and Britain lagged behind in this important matter."

F. S. J. Ivay, President National British Citizenship League, Moose Jaw, Saskatchewan, Canada (12 May, 1919): "It will be a pleasure to me to assist to establish a unit system of Dollar-Meter-Liter-Gram for world-wide adoption."

Chamber of Commerce, Montreal, Canada, thru Leon Lorrain, Secretary (16 July, 1919): "Whereas, it is of the highest importance that after the war, Canada develop her foreign trade by increasing the commerce already established and by entering new fields; and it is important therefore that commerce be facilitated in every possible way:

"Whereas, the weights and measures now in use in Canada are a hindrance to Canadian commerce and to world-wide commerce;

"Whereas, the metric system is a great deal more simple, and already in use thruout the world, as is well known, as for example in Germany, in Central and South America, in Austria, in Belgium, in Denmark, in Spain, in France and the French colonies, in Holland, in Italy, in Portugal, in Roumania, in Sweden, etc.;

"The Chamber of Commerce of the district of Montreal begs to recommend that the government of the Dominion of Canada decree that the metric system shall be concurrently used with our present weights and measures for a certain number of years and then, after a fixed date, shall be made obligatory and the only legal standard of measurement in Canada."

Confederation of Co-operative Agricultural Societies of Quebec, Montreal, Canada (12 May, 1920): "The Confederation gives its entire support to the campaign undertaken to obtain the adoption of the metric measures in the British Empire and all its possessions."

Calgary Board of Trade, Calgary, Alberta, Canada, thru D. G. Campbell, Secretary: "At a meeting of the council of the Calgary Board of Trade, held 27 June, 1919, the exclusive use of Meter-Liter-Gram thruout Canada and the United States of America was unanimously endorsed."

British Steel and Iron Exporters, Ltd., thru W. Ridley Makepeace, Managing Director, London, British Isles: "In furtherance of the efforts now being made in the United States of America for the adoption of a World's Standardization of Weights and Measures, we make formal appeal for such steps as may ultimately bring about the universal adoption of the Meter-Liter-Gram system."

ORGANIZATIONS AND ASSOCIATIONS IN THE BRITISH COMMONWEALTHS URGING METRIC STANDARDIZATION

(Address is **British Isles**, unless otherwise stated.)

Association of Trade Protection Societies; Association of Technical Institutes; Associated Chambers of Commerce of Australia; Arundel Mutual Improvement Society; Aberdeen Chamber of Commerce; Anglo-Belgian Chamber of Commerce; Ashford Chamber of Commerce; Council of Society of Accountants and Auditors; Association of British Exporters, Incorporated; Anglo-French Society, London; Association of Great Britain and France, London; Anglo-Belgian Union, London; Agricultural Seed Trade Association, London; Aberdeen Rotary Club; Association of British Motor and Allied Manufacturers, Limited, London; Bradford Textile Society; Council of British Horological Institute; Birmingham Rotary Club; Brighton Rotary Club; Bedford Trade Protection Society; Court of Blacksmith's Company, London; Bromley Chamber of Commerce; Birmingham Chamber of Commerce; Batley Chamber of Commerce; Belfast Chamber of Commerce; Birstall Chamber of Commerce; Bolton Chamber of Commerce; Bradford Chamber of Commerce; Bury Chamber of Commerce; Bath Chamber of Commerce; Belgian Chamber of Commerce in London; British Chamber of Commerce, Brazil; British Chamber of Commerce, Buenos Aires, Argentina; British Chamber of Commerce for the French Riviera, and the Principality of Monaco; British Chamber of Commerce of Egypt; Bridgwater Chamber of Commerce; British Chamber of Commerce for Italy (Genoa); British Chamber of Commerce of Paris (Inc.), Paris; British Medical Association; Burnley Chamber of Commerce; National Federation of Building Trade Employers of Great Britain and Ireland; British Empire Producers' Organization; British Italian Corporation, Limited; British Science Guild, London; Bath Grocers' and Provision Dealers' Association; Blackburn and District Retail Grocers' Association; Blackburn Guardian Society; Blackpool Tradesmen's Association; Bradford Guardian Society, Limited; Beverley Corporation; Bideford and District Chamber of Trade, N. Devon; Chamber of Commerce, Baroda, India; Coventry Chamber of Commerce; Canterbury (New Zealand) Chamber of Commerce; Cardiff Chamber of Commerce; Carmarthen Chamber of Commerce; Cork Chamber of Commerce; Croydon Chamber of Commerce; Cardiff Rotary Club; National Co-operative Men's Guild; Federation of Curriers, Light Leather Tanners and Dressers; Institute of Chartered Accountants; Institute of Certificated Grocers; Colwyn Bay Grocers' Association; Cardiff Chamber of Trade; City of Quebec, Canada (thru City Treasurer); Committee on Neglect of Science; Dublin Rotary Club; Dorchester Chamber of Commerce; Dewsbury Chamber of Commerce; Dover Chamber of Commerce; Dundee Chamber of Commerce; Dublin Chamber of Commerce; Dublin Mercantile Association; Daventry Trade Protection Society; Edinburgh Chamber of Commerce; Exeter Chamber of Commerce; Ely Traders' Association; East India Association; Edinburgh Rotary Club; Eastbourne Trade Protection Society; Eastbourne and District Grocers' Association; Edinburgh and Leith Licensed Grocers' Association; East of Scotland Co-operative Conference Association; Falmouth Chamber of Commerce; Federation of Foreign Chambers of Com-

merce; Folkstone and Sandgate Trade Protection Society; Future Career Association, London; General Medical Council, London; Glasgow Rotary Club; Glasgow and West of Scotland Guardian Society for the Protection of Trade; Goole Chamber of Commerce; Great Grimsby Chamber of Commerce; Greenock Chamber of Commerce; Glasgow Licensed Grocers' Association; Gloucester Chamber of Commerce; Gloucestershire Farmers' Union; Hull Guardian Society; Hartlepool Chamber of Commerce; Huddersfield Chamber of Commerce; Halifax Chamber of Commerce; Hunstanton Tradesmen's Association; Halifax Trade Protection Society; Horticultural Trades' Association of Great Britain and Ireland; Incorporated Society of Inspectors of Weights and Measures; Iron and General Metal Trades' Section of Liverpool Chamber of Commerce; Ipswich Chamber of Commerce; Jersey Chamber of Commerce; Kendal Chamber of Commerce; Kidderminster Chamber of Commerce; London Association for the Protection of Trade; Liverpool Cotton Association; Liverpool Corn Trade Association; Liverpool General Brokers' Association; Liverpool West Indian Association; Liverpool Woolbrokers' Association; Liverpool Warehouse Association; Liverpool Provision Trade Association; Committee of London Wholesale Jewellers' and Allied Trades' Association; Leicester Rotary Club; London Rotary Club; London Chamber of Commerce; Leicester Chamber of Commerce; Lincoln Chamber of Commerce; Llanelly Chamber of Commerce; Letchworth Chamber of Commerce; The City of London County Purposes Committee; Leicestershire Trade Protection Society; Liverpool Incorporated Trade Protection Society; Liverpool Timber Trade Association; Liverpool General Brokers' Association, Limited; Liverpool and District Society of Incorporated Accountants; London and Suburban Traders' Federation; London Association of Accountants, Limited; Morley Chamber of Commerce; Metropolitan Grocers' and Provision Dealers' Association; Manchester Guardian Society; Parliamentary Sub-Committee of Town Council of Manchester; Council of Manchester Association of Importers and Exporters; Manchester Timber Trade Association; Midland Granite Quarrymasters' Association; Mutual Communication Society, London; Newcastle Rotary Club; National Farmers' Union; Nottingham and Derby Traders' Association; Northampton Chamber of Commerce; Newport Chamber of Commerce (Inc.); Netherlands Chamber of Commerce; Nottingham Chamber of Commerce; National Association of Flour Importers of Great Britain and Ireland; National Association of British Exporters; North Kent and District Chemists' Association; National Association of Master Bakers and Confectioners of Great Britain and Ireland; Portsmouth Rotary Club; Provincial Electric Supply Committee of the United Kingdom; Port of Plymouth Incorporated Chamber of Commerce; Portsmouth Chamber of Commerce; Pembroke Dock Chamber of Commerce; Poole Chamber of Commerce; Physical Society of London; Plymouth Institution and Devon and Cornwall Natural History Society; Reading Chamber of Commerce; Redruth Chamber of Commerce; Ramsgate Chamber of Commerce; Rochester Naturalists' Club; Rochester Philosophical Club; Rhodesia Scientific Association; Ratby Co-operative Society; Royal Dublin Society; Royal Photographic Society, London; Royal Sanitary Institute, London; Sales Managers' Association; Swansea Metal Exchange; Stationers' Association, London; Swansea and District Grocers' and Provision Dealers' Association; Sleaford Tradesmen's Association; Scottish Trade Protection Society; Snaith Chamber of Agriculture; Somersetshire Chamber of Ag-

riculture; South African Association for Advancement of Science; Scottish Commercial Travellers' Association; Swansea Chamber of Commerce; Stroud Chamber of Commerce; Stratford-on-Avon Chamber of Commerce; Sheffield Chamber of Commerce; Stockton and Thornaby Chamber of Commerce; Sunderland Chamber of Commerce; Southampton Chamber of Commerce; Salt Chamber of Commerce; Transvaal Chamber of Mines; Timber Trade Federation of the United Kingdom; Torquay Chamber of Commerce; Tunbridge Wells Chamber of Commerce; Totnes Union Chamber of Agriculture; Transvaal Branch Society of Accountants and Auditors; Warwick, Leamington, and Stratford-on-Avon Grocers' Association; Warwickshire Chamber of Agriculture; Wellingborough Grocers' Association; Weston-super-Mare and District Trade Protection Society; West Riding Trade Protection Association; Wimbledon Commercial Union; Whitechurch Dairy Farmers' Association; Wadebridge Farmers' Club; Worcestershire Chamber of Agriculture; Wakefield City Tradesmen's Association; Woolwich Chamber of Commerce; Wakefield Chamber of Commerce; Wolverhampton Chamber of Commerce; Worcester Chamber of Commerce; Warrington Chamber of Commerce; Whitehaven Scientific Association; Yorkshire District Society of Incorporated Accountants and Auditors.

TOWN, BOROUGH, URBAN DISTRICT, COUNTY AND RURAL DISTRICT COUNCILS IN THE BRITISH ISLES URGING GRADUAL METRIC STANDARDIZATION

Abingdon; Appleby; Abercarn; Abram; Alsager; Arlecdon & Frizington; Ashford; Alfreton; Ardsley (East & West); Annfield Plain; Atcham; Aberdeen; Beccles; Birkenhead; Blackpool; Bridlington; Batley; Brighton; Bethnal Green; Beverley; Bootle; Burnley; Battersea; Basingstoke; Bury; Burton-on-Trent; Bodmin; Bideford; Banbury; Barrow-in-Furness; Bargoed; Bedwellty; Barnoldswick; Barton-upon-Humber; Bedlingtonshire; Bedwas & Machen; Benfieldshire; Bishop Auckland; Bolsover; Bridgend; Brierfield; Brynmawr; Budleigh Salterton; Burnham-on-Crouch; Burry Port; Bushley; Brixham; Beckenham; Birmingham; Birkenshaw; Barry; Braintree; Bakewell; Barnstaple; Blackburn; Bridport; Bradfield; Broomsgrove; Bucklow; Belford; Crewe; Cambridge; Chatham; Camberwell; Chelsea; Cardiff; Chester; Croydon; Coventry; Canterbury; Carnarvon; Cardiganshire; Cowes; Cuckfield; Cheriton; Clayton; Coulsden and Purley; Crowle; Consett; Caerleon; Crewkerne; Caister; Campden; Chelmsford; Clutton; Colwyn; Cranbrook; Crick; Chapel-en-le-Frith; Dudley; Derby; Dewsbury; Dover; Deptford; Dundee; Dunfermline; Dunstable; Dartford; Dwyran; Dorset; Denbigh; Devonport; Durham; Ealing; East Suffolk; Exeter; Eastbourne; Earby; East Cowes; Edmonton; Egham; Easington; Ellesmere; Epsom; Eastbourne; Essex; East Sussex; Folkestone; Falkirk; Forres, Fulham; Foleshill; Forehoe; Gateshead; Galashiels; Glasgow; Govan; Godalming; Great Torrington; Great Yarmouth; Gillingham; Garforth; Gellygaer; Greenford; Greetland; Gower; Gnosall; Glossop; Grimsby; Gloucestershire; Hammersmith; Huddersfield; Haddington; Hastings; Hythe; Harrogate; Holborn; Hampstead; Hanwell; Harpenden; Haslemere; Heston-Isleworth; Hinckley; Holme Cultram; Holmforth; Honley; Hollingworth; Hampton Wick; Hindley; Hampton; Hessle; Hailsham; Hambledon; Hartlepool; Hay; Hemsorth; Highworth; Hitchin; Houghton-le-Spring; Halifax; Hey-

wood; Hampshire; Hull; Huntingdon; Inverness; Ilkeston; Ilminster; Ilfracombe; Isle of Thanet; Isle of Wight; Islington; Jarrow; Kirkcaldy; Kidderminster; Kidwelly; Kenilworth; Keswick; Kingswood; Kirkby Lonsdale; Kettering; Kidsgrove (Staffs); Keighley; Kingston-upon-Hull; Kesteven; Leamington Spa; Leicester; Luton; Lanarkshire; Longton; Liverpool; Ladybank; Largs; Leominster; Llanelly; Loughborough; Lyme Regis; Leadgate; Leyton; Llandrindod Wells; Llanfrechfa Upper; Llantarnam; Longbenton; Ludgvan; Lepton; Litherland; Llandyssul; Ludlow; Little Hulton; Loftus; Lostwithiel; Lydd; Lindsey; Lewisham; Monmouth; Middlesborough; Morecambe; Malton; Mexborough; Maryport; Middlewich; Midsomer Norton; Mountain Ash; Mumbles; Merthyr Tydfil; Mansfield; Morpeth; Middlesex; Macclesfield; Newport (Mon.); Northampton; Nottingham; Neath; Newport (Fife); Newcastle-under-Lyme; Nantwich; Newton-in-Makerfield; Newton & Llanllwchaiarn; Norden; Normanton; Northfleet; Newent; Newhaven; Newport (Salop); Norton; Northwich; Newmill; New Windsor; Newport, Isle of Wight; Oban; Oadby; Oakengates; Ozmore & Garw; Oulton Broad; Otley; Ongar; Oswestry; Peterhead; Poole; Peterborough; Padham; Paignton; Panteg; Paul; Penynont; Petersfield; Pontardawe; Pottersbury; Pros Kairon Dwyran; Procklington; Preston; Penzance; Pembroke; Pembrokeshire; Reading; Richmond, Surrey; Rochdale; Richmond (Yorks); Ramsgate; Ramsbottom; Redditch; Redruth; Rhymney; Rishton; Rothwell (Northants); Royton; Runcorn; Rickhill; Romford; Rugby; Rye; Rochester; Radnorshire; (Education Committee); Sheffield; Stafford; Stockport; Scarborough; Shoreditch; Stoke Newington; Swindon; St. Pancras; Salford; Selkirk; Saffron Walden; Southend-on-Sea; Stourbridge; Salcombe; St. Annes-on-Sea; Sandgate; Selby; Slaithewaite; Sheerness; Shelf; Shoeburyness; Shoreham-by-Sea; Southwick; Southgate; Sowerby; Sowerby Bridge; Soyland; Stanhope; Stanley; Stevenage; Stone; Stratton & Bude; St. Albans; Slough; Southwick-on-Wear; Sutton (Surrey); St. Germains; Sefton; Shifnal; South Stoneham; Stratford & Wolverton; Sleaford; Southampton; Stratford-on-Avon; Southwark; Sunderland; Salop; Truro; Thornaby-on-Tees; Tillicoultry; Tayport; Thurso; Todmorden; Tilbury; Torrington; Totnes; Thornton; Thurlestone; Thurstonland; Tavistock; Upholland; Usk; Ulverston; Walsall; Worcester; Wandsworth; Welshpool; Wigan; Worthing; Wimbledon; Wokingham; Walmer; Warblington; Warminster; Waterloo & Seaforth; Watford; Wealdstone; Wembley; Whitstable; Whittington and Newbould; Winsford; Wirksworth; Wivenhoe; Withnell; Watchet; Woking; Whickham; Ware; Warmley; Weardale; Westhampnett; West Penwith; Wortley; Worcestershire; Wallsend; Warwickshire; West Suffolk; West Sussex; Westmorland; York; Yeovil.

EMINENT BRITONS URGING METRIC STANDARDIZATION

Marquess of Lansdowne, British Secretary of State for Foreign Affairs in 1904: "We are all agreed that the existing weights and measures system—if indeed it is worthy of the name of system—is one to which overwhelming objections can be urged. It is distracting to learners, and obstructive to trade, home and foreign, and it is probably advantageous to none, unless it be to the dishonest trader, who is able to profit by the confusion which prevails."

Viscount Bryce, O. M. (Rt. Hon. James Bryce) when asked to endorse the Metric System, said: "I am in cordial sympathy with the aims of the Decimal Association."

Rt. Hon. Reginald McKenna, Chairman of the London Joint City and Midland Bank, Chancellor of the Exchequer, 1915-1916: "The adoption of the Metric System of weights and measures in the British Isles, would increase the efficiency of manufacturing and facilitate the calculations involved in the marketing and distribution of goods. It would be of great advantage to us in our trade with other manufacturing and trading countries, all of which, with the sole exception of the United States of America, already use this system."

Rt. Hon. T. J. Macnamara, British Minister of Labor: "I cannot see how we can keep abreast with modern nations in the commercial struggle if we flagrantly waste our time pottering along with our antiquated system of coinage, weights and measures."

Earl of Rosebery, Prime Minister of England, 1894-1895: "I attach so much importance to the adoption of metric weights and measures, that I believe if you carry it out, it will be of infinitely more advantage to British commerce than all the fiscal remedies proposed by . . members of the Government."

Sir Gilbert Parker, Baronet, the well-known Author: "I am in hearty sympathy with the work for the establishment of the Metric System in the British Isles."

Lord Emmott, Director of the War Trade Department, 1915-1919: "I believe the introduction of the Metric System of weights and measures would be of advantage to this country in foreign trade, and would simplify transactions in our home trade."

Rt. Hon. Sir George E. Foster, P.C., K.C.M.G., D.C.L., Minister of Trade and Commerce of the Dominion of Canada: "It would be a great advantage that the metric weights and measures should be adopted commonly thruout the Empire, and it will be a subject for decision after the war is over in connection with methods of reconstruction and development to be discussed at that time."

Sir Henry Norman, Bart., M.P., British House of Commons: "To waste so much time in mastering our present tables of weights and measures is to squander our most precious national asset, the efficiency of the rising generation."

Sir William Bull, P.C., M.P.: "For many years I have been a firm believer in the Decimal System, and I would do everything in my power to make the Metric System of weights and measures the law of the land."

Sir Horace Plunkett, eminent Irish authority on Agriculture: "I am fully in sympathy with the adoption of Metric weights and measures. Any experience which I have had in business matters both in the British Isles and the United States, has impressed me with the need which exists for a considerable simplification of our present complicated system of weights and measures."

Sir E. Marshall-Hall, Eminent British Advocate: "My reasons for advocating the adoption of Metric weights and measures are that it will tend to simplify calculation, when once the change is mastered, and will also facilitate our commerce with other nations using the same system."

Hon. Geo. B. Edwards, sometime M.P. for North Sydney, in the Australian House of Representatives: "We know the millions the adoption of the Metric System would save, the reduction of mental and physical labor it would effect, the cheaper and more rapid education that would result, or the higher and more complete education it would allow, the impetus that would be given to British manufacturing industries, by bringing them into accord with the common requirements of the great majority of the world's people; and the general advantage of having a common measure for humanity."

Rt. Hon. John Hodge, M.P., Secretary of Steel Smelters' Association, British Isles: "There can be no question as to the time saved by the exclusive use of the Decimal System in the British Isles. It would save the children at school endless worry, would enable the teacher to devote more time to other phases of education, and how much easier it would be for those of us who have got beyond that stage in the numerous calculations necessary to make, monetary or otherwise."

W. A. Appleton, Secretary of the International Federation of Trade Unions: "Anything which affects Britain's external trade is of profound importance. These weights and measures of ours cheat the home buyer and intensify the suspicions of the foreigner. If we are to succeed in international commerce we must adopt terms of value which other nations understand. Whatever the cost of this, it will be less than the cost of doing nothing."

Sir James Yoxall, Secretary to the National Union of Teachers, British Isles: "Careful calculations have been made, and I am convinced that at least a year of an ordinary scholar's life at a public elementary school could be economized for the teaching of other subjects, if a Decimal System of money, weights and measures were in exclusive use."

Sir Fortescue Flannery, Baronet, Consulting Engineer, Ex-President of the British Institution of Marine Engineers: "I have no hesitation in confirming opinions previously expressed that it is in every way desirable to adopt the Metric System in the British Isles, both for weights and measures, because such a change would produce infinitely greater facility, not merely in commercial transactions, but also in manufacturing practice."

Sir William Preece, eminent British Electrical Engineer: "The whole trade of the world involves the use of a uniform system of units, and that system must be, with our present knowledge, based on the metric system."

Sir Benjamin Baker, eminent British Engineer: "In many offices I am certain that the difference between the two systems would be represented by 20 to 30 per cent. of the clerks; that is to say, you could effect a saving of 20 to 30 per cent. of the clerks, if the Metric System were introduced."

Hon. Hugh Crawford, Chairman of the National Bank of South Africa: "There is another matter of which I have often spoken—the desirability of replacing our present cumbersome monetary system by the system of decimal coinage, likewise our system of weights and measures by the Metric System. The loss of time involved in our schools, in our shops and offices, and throughout our commercial life, in prosecuting calculations under the present system, must be tremendous."

Sir Edward Holden, former Chairman of the London Joint City and Midland Bank, London: "It must be apparent to everyone that if we have to conduct our trade using English weights and measures and currency,

while other countries can trade with each other under the Metric and Decimal Systems, we shall obviously be placed at a great disadvantage, and, in my opinion, this question ought to be taken up and pushed forward without any delay."

F. Henry Royce, of Rolls-Royce: "I shall be pleased to accept the position of Vice-President of the Decimal Association or do anything I can to help forward metric standardization."

Oliver R. H. Bury, M. Inst. C. E., former General Manager of the Great Northern Railway: "I have spent some years of my life abroad in Brazil and the Argentine where we used the Metric System, and I have come back here to our system, and the experience of working the two, shows that the advantage to be gained by adopting the Metric System is enormous in simplicity."

Sir Vincent Caillard, Director of Vickers Limited, and Past President of the Federation of British Industries: "I am wholly in sympathy with the Decimal Association's efforts to bring about the general adoption of the Decimal System."

Sir Andrew Noble, some time Chairman of Sir W. G. Armstrong Whitworth & Co., the celebrated Engineers and Armament Makers: "The one great advantage the Metric System has, is that if we adopt it, we have with that a uniformity of measure for all countries. I need not say it is hopeless to get other nations to adopt our system, and nobody can dispute the advantage it would be to us if there was but one system of weights and measures throughout the world. . . . In my opinion the Metric System ought to be made exclusive within a certain number of years."

Sir G. B. Hunter, K. B. E., Chairman of Swan, Hunter & Wigham Richardson, Builders of the "Mauretania": "Any expense or inconvenience caused by the adoption of the Metric System in connection with shipbuilding business would be trifling, and would be far outweighed by the advantage of the improved system in our home business and in foreign negotiations."

Sir John I. Thornycroft, the famous Naval Architect and Director of John I. Thornycroft and Co., Shipbuilders, Southampton, England: "In answer to your enquiry as to the most effective means of increasing our overseas trade—I feel very earnestly that we should at once follow the great majority of other countries who have adopted a Decimal System of coinage, weights and measures. The present is a most opportune time for making the change to the Metric System, because hundreds of thousands of our younger men have already become familiar with the system during active service abroad."

Among the other eminent Britons urging metric units are: Lord Northcliffe; Sir Oliver Lodge; Sir James Reckitt, Bart., Yorkshire; A. W. Rogers, Sc.D., F.R.S., London; Sir Albert K. Rollit; Sir Thomas Robinson (formerly Agent General for Queensland in London); Sir Philip Watts, K.C.B., LL.D., F.R.S., M. Inst. C.E., M.I.M.E. (past Director of Naval Construction at British Admiralty); Sir James Wilson, K.C.S.I., Scotland; John McLeod, M.P.; Major-General Beresford Lovett, R.E., C.B., C.S.I.; Lady Lowther, London; Sir Harry H. Johnston, K.C.B.; Sir E. Tootal-Broadhurst, Bart., Manchester; Sir Harry Lauder; Sir Stuart Coats, Bart., M.P.; Lord Desborough, President, British Imperial Council of Commerce; Major David Davies, M. P.; Judge Becher Ellicott, Bristol; Sir Algernon F. Firth, Bart., Yorkshire; Lewis Haslam, M.P.; Lt.-Col. Arthur Smithells, C.M.G., F.R.S.,

No Piecemeal Adoption:

ALLCOCK, HARRY, M. I. E. E., Honorary Secretary-Treasurer, Manchester and District Decimal Association, British Isles:

"I submit that any such voluntary piecemeal adoption cannot be expected, as the pioneers would thereby penalize themselves by throwing themselves out of touch with their neighbors." *Surveyor,* 27 April, 1917.

STUBBS, A. J., Member British Institutes of Civil and Electrical Engineers:

"The interactions of modern life render it impossible to secure any considerable advance on permissive terms—it is not practicable for one or more districts, for one or more trades, or for one or more utilities or administrations to adopt any advance in weights and measures unless the metric units are made the exclusive legal standards." *Decimal Educator,* p. 155, September, 1919.

MARTIN, Major A. J., British Author and Metric Advocate:

"The British are waiting for one another as tho paralyzed.

"To avoid laying down a duplicate set of machinery for the home and foreign markets, many manufacturers have waited for a demand for goods in metric quantities to come from the retailers.

"The Retail Trader who would prefer the quicker decimal system cannot afford to play with his business and adopt the metric system, if all his competitors in the same town and district do not make the change with him. He is, therefore, waiting for the Wholesale Trader to alter.

"The Consumer is not individually concerned except indirectly, because he has a vested interest in the country which shows signs of losing its vitality, i. e., adaptability. He is therefore only concerned as a voter, and unless a general or exclusive law is passed, must wait until the question is put before the country. But it is not a party question!

"The Schoolmaster is waiting to discontinue teaching the British measures and weights until he is sure the Metric System will be universally adopted before his pupils enter upon their commercial careers. And so on.

"Whilst therefore the mass of intelligent people and the throbbing hives of industry are waiting for a law making metrics the exclusive units, about ½ of the Members of the British Imperial Parliament, of all shades of politics, are withholding the law 'until the system is adopted.' *The position reminds one of the old ditty:*

'Said Chatham, with his sword half drawn,
I'm waiting for Sir Richard Strachan:
Said Strachan, I'm longing to be at 'em,
But I'm waiting for the Earl of Chatham.'"

"The Empire which hesitates is lost." *"One Language in Commerce,"* T. Fisher Unwin, London, British Isles, 1906.

9

Present Jumble Causes Great Loss

Summary

Consideration of world trade demands and activities shows the absurdity of objecting to metric standardization as costly. The present "farrago of weights and measures" used in the United States of America causes an annual loss of millions of dollars in world business.

Metric Units Would Increase World Trade

Exclusive use of metric units would increase U. S. American world trade. With metric standardization after 1871 German world trade underwent a phenomenal growth.

Changed world trade demands have brot the need of changed units of weight and measure for the United States. Manufactured products have largely taken the place of raw material.

Present Units a Handicap

Our old grotesque weights and measures can not face competition in world trade. These archaic units cause an intolerable loss. Manufacturers now realize that they must supply metric countries with metric goods. Duplication of catalogues and machines is now necessary in order to comply both with the world units and with U. S. American unrelated weights and measures. Along with simple dollar-meter-liter-gram manufacturers must use a bewildering and antiquated jumble of units. The loss from time and effort spent in converting these values amounts to millions of dollars yearly in world trade.

Cheating Aided by Confusion

Present confused weights and measures in the United States of America facilitate cheating. World traders who do not understand U. S. American units may be abused easily in commercial relations. They realize this and are consequently prejudiced against American goods. An analogy in point arises in the case of a young American recently in London: "The cabman said half a crown. I gave him half a pound. He said, 'Thank you, Sir!' Next day I discovered that he ought to have given me some change." London "cabbies" realize that foreigners do not understand British Isles undecimalized money. Prospective Latin American and Oriental customers are no more familiar with the U. S. American heterogeneous weights and measures than Americans are familiar with British money.

Metric Units Only Possible World System

Meter-liter-gram are the only possible world units.

There is much specific testimony from exporters. They know that exclusive use of metrics would increase U. S. American trade. (Consular reports cited in Chapters 9, 13 and 14 of this book prove the absolute need of metric units to transacting world trade.)

Our false conservatism in neglecting metric standardization is a barrier to free exchange. It is inexplicable that the United States of America should continue to embarrass world business transactions by an "endless, senseless diversity of instrumentalities." Any seeming difficulty vanishes by looking at the adoption of metrics in the light of evolution. With the spread of commerce and advance from barter to world trade there have been first local, then national,

tile Association; Dodwell & Co. (China Merchants); Day & Fox (Woolen Manufacturers); John Dickinson & Co., Ltd. (Paper Manufacturers), London; Alex. M. Duckham (Trinidad Central Oil Fields), London; J. Dampney & Co. (Anti-Fouling Composition Makers), Cardiff; H. Dawson & Co. (Wool Brokers), London; Richard Dickeson & Co., Ltd. (Wholesale Grocers), London; Harold M. Duncan (Lanston Monotype Corporation, Ltd.), London; Sir Alfred Dent, K.C.M.G. (Merchant), London; Edinburgh Merchants' Association; Elder Dempster & Co. (Shipowners); George Ellis (Woolen Manufacturer); Major J. Shipley Ellis (Merchant); T. F. Firth & Sons (Woolen Manufacturers); T. G. Fison (Woolen Manufacturers); Edwin R. Firth (Woolens); Frank Fleming (Brewer), Newcastle-on-Tyne; Farquhar & Gill (Colour Manufacturers); Grimwade's, Ltd. (Manufacturers of Earthenware); John J. Griffin & Sons, Ltd. (Scientific Instrument Makers), London; M. Godlee (Cotton Spinner); Alfred Goodman (Worsted Spinner); Gall & Phillips (Hat Manufacturers); Greenwood & Batley, Ltd. (Ammunition Manufacturers); Gryfe Tannery, Ltd.; Charles Herrold & Co., Ltd. (Refiners and Assayers), Birmingham; Howse, Mead & Sons, Ltd. (Woolen Warehousemen), London; Horlick's Malted Milk Co.; Robert Hitchin & Co., Ltd. (Manufacturers), London; Hamlyn Brothers, Ltd. (Manufacturers of West of England Coatings), Devon; Frank Horsell & Co., Ltd. (Manufacturers' Merchants), Leeds; Ferguson & Simpson, Ltd., London; Ferranti, Ltd., Electrical & General Engineers, Lancashire; Faire Bros. & Co., Ltd., Leicester; John Fulton & Co., Ltd., Belfast, Ireland; France & Canada Steamship Co., Genoa, Italy; F. H. Faulding & Co., Adelaide, Australia; Adrien Felumb & Co., Sydney, Australia; Robt. Gardner & Son, Montreal, Canada; John Gosnell & Co., Ltd., London; Gonville, Jarvis & Co., Ltd., Stratford, London; Gawith Hoggarth & Co., Helsington Mills; John George & Sons, Ltd., London; Gurney Foundry Co., Toronto, Can.; Glen Steel, London; F. F. Gregory, Roberts, Gregory & Co., Ltd., Bedsford; Holiday Fellowship, Ltd., Conway, North Wales; William Hodgson & Co., Deansgate, Manchester; T. Harding, Son & Co., St. Philip's Bridge, Bristol; Hardware Manufacturing Co., Walsall; Hollow Ware Industries, Birmingham; Geo. H. Hees, Son & Co., Ltd., Toronto, Canada; Jas. C. Heighway, of Edwards, Dunlop & Co. (London), Ltd., Wholesale Stationers and Agents, London; A. F. Hunt, London; William Hay, Mnfg. Chemists, London; Harden Star Lewis & Sinclair Co., London; A. L. Hoare, Central Produce Mart, Port Elizabeth, South Africa; Wm. A. Imes, Manager, Imes Land Company, Calgary, Alta., Canada; Richard Ibbotson, Sheffield; Indestructible Paint Co., Ltd., London; Iron and Steel Trades Confederation, London; H. E. Jackson, Ltd., Leicester; Joseph Johnson & Co., Ltd., Leicester; Kitson Empire Lighting Co., Ltd., Stamford; Kirkby, Ltd., Manchester; J. H. Kemp, care Grindley & Co., 54 Parliament St., London; Edgar Kenyon, Ltd., Manchester; John T. Kidson, Thomas Kidson & Sons, Ltd., Willenhall; E. Leonard & Sons, Ltd., London; G. Lockett, Lockett & Co., Calgary, Alberta, Canada; Lariviere Inc., Montreal, Can.; Leadley Manufacturing Co., Ltd., Winnipeg, Can.; Lamontagne, Ltd., Montreal, Can.; Jos. Linteau, Commission Agt., Quebec, Canada; The London Button Co., London; The London Dye Manufacturing Co., Ltd., London; Lace Web Spring Mattress Co., Sandiacre; Daniel Layborn & Co., Liverpool; Laing, Wharton, Ltd., London; J. D. Leith of Smith & Williamson, Glasgow; J. H. Le Martin, Saskatchewan, Canada; James Leigh, Grocer, Brighton; London Chemical Works, Southall; Hogg & Henderson (Shipowners); Frank Holroyd (Cot-

ton Spinner); John Holden (Bobbin Manufacturer); J. H. Horsfall (Worsted Spinner); J. Hamlyn (Woolen Manufacturer); Hull & District Fruit Buyers Association, Ltd.; Imperial Bedstead Co.; Imperial Tobacco Co. (of Gt. Britain and Ireland), Ltd.; Charles Jenner & Co. (Silk Mercers), Edinburgh; W. E. & R. S. Johnston (Shipowners); Jaegers Sanitary Woolen System Co.; C. J. Johnston (Woolen Manufacturer); Johnson Matthey & Co. (Refiners); J. A. Jordan & Sons, Ltd. (Enamellers); Kettlewell, Bullen & Co. (East India Merchants), London; John Knight & Co., Ltd.; Kynoch, Ltd. (see Index); Abel Kershaw (Woolen Manufacturer); Alfred Kingston & Co., Ltd. (Merchants); Loders & Nucoline (Edible Oil Refiners), London; Abram Lyle & Sons (Sugar Refiners), London; W. H. Lister (Woolen Manufacturer); John T. Lee (Spinner); Liebigs' Extract of Meat Co.; Thomas Lowe & Sons (Contractors); S. C. Larkins & Sons, Ltd. (Wholesale Textile Merchants), Birmingham; E. Lloyd & Co. (Merchants), London; Locke, Blackett & Co., Ltd. (Lead Manufacturers), Newcastle-on-Tyne; Donald Lowe & Co., Ltd. (Woolen Merchants), Scotland; Henry Milward & Sons, Ltd. (Manufacturers of Needles, Fish Hooks); Manfield & Sons (Boot Manufacturers); Maypole Margarine Works, Ltd.; Mander Brothers (Varnish Manufacturers); Millar's Timber & Trading Co., Ltd. (Australian Hard Wood Importers), London; Munster Merchants' Association; Middleton's Bedstead Co.; Marshall Kaye & Marshall, Ltd. (Woolen Manufacturers); W. H. Mitchell (Woolen Manufacturers); Hy. Metzler & Co. (Chemists and Druggists); H. T. Milward, of Henry Milward & Sons, Ltd., manufacturers of needles, fish hooks and fishing tackle, Redditch; Lt. Col. John W. Madden, Director of the Great Northern Railway, Ireland; Alex McDermind, Sec'y, Record Oil Company, Calgary, Alta., Canada; McDougal's, Ltd., Ottawa, Can.; Marsh, Jones & Cribb, Leeds; Naylor Brothers, Varnish Manufacturers, 409 Oxford St., W. London; Nitedals Match Co., London; North American Collieries, Edmonton, Canada; Mathews & Yates, Ltd., Manchester; McKinnon Industries, Ltd., St. Catharines, Ontario; John McNicol Son, Glasgow; Mellen's Food, Ltd., Peckham, London; William Monkhouse, Manufacturer of Wicker and Cane work, York; J. G. Morley, Piano Manufacturer, London; Muller Laboratories, Ltd., London; R. W. O'Donoghue, London; Orr's Zinc White, Limited, Widnes; O'Neill & McHenry, Londonderry, Ireland; Pritchard & Co., London; Padmore & Barnes, Ltd., Northampton; Parker & Lester, Ltd., London; J. J. Parker, Sheffield; Pease Pillow Co., London; Ingram Perkins & Co., London; Geo. T. Poole & Co., Bradford; B. B. Ryce Flour Mills, G. D. Brundrit, President, Winnipeg, Canada; Portholme Aircraft Co., Ltd., Huntingdon; D. Prior & Son, Colchester; William Pretty & Sons, Ltd., Ipswich; Quakers Oats, Ltd., London; Rational Association, Manchester; Ross, Courtney & Co., Ltd., London; M. Risk & Sons, Ltd., Glasgow; W. Rountree & Sons, Scarborough; Wm. H. Muller & Co. (Merchants); D. B. McCallum & Son, Ltd.; Morland & Impey, Ltd. (Loose Leaf Ledger Manufacturers), Birmingham; Andrew Motherwell, Ltd. (Grain Manufacturers), Glasgow; McClelland Bros. (Hardware Merchants), Birmingham; J. John Masters & Co., Ltd. (Matches), London; Richard May & Son (Timber Merchants and Importers), London; Wm. Mitchell (Pens) Ltd. (Steel Pen Manufacturers), Birmingham; Mercers Company, London; National Radiator Co., Ltd. (Radiator and Boiler Manufacturers); H. & W. Nelson (Shipowners); Jos. Newsome & Sons (Woolen Manufacturers); Frank Nicholson, Managing Director, C. Vaux and Sons, Ltd. (Brewers); Natal Manufac-

turers' Association (South Africa); North British Rubber Co., Edinburgh; H. J. Packer & Co. (Cocoa and Chocolate Manufacturers); William Pretty & Sons, Ltd. (Corset Makers); Thos. Purdy & Sons (Shoddy Manufacturers); H. B. Priestman (Woolen Manufacturer); Priest Marians & Co. (Merchants); Priestman Brothers, Ltd.; George Partridge & Co. (Provision Merchants); Padmore & Barnes, Ltd. (Footwear Manufacturers); J. D. Player (Tobacco); Pearman & Corder, Ltd. (Importers of Foreign Produce); Plymouth Incorporated Mercantile Association; A. & F. Pears, Ltd. (Soap Makers); Rochdale Merchants' and Tradesmen's Association; A. F. Rowbotham & Co. (Meat Salesmen); George Roberts & Co., Ltd. (Woolen Manufacturers); J. H. Roberts (Woolen Manufacturer); Arthur Robinson (Worsted Spinner); Ridgway's, Ltd. (Tea Merchants); C. J. Saunders, Coachbuilder, Biggleswade; J. A. Sinclair & Co., Ltd., London; John Somerville & Co., Edinburgh, Scotland; James B. Sutherland, Webb, Read & Co., Calgary; Sydney Buying Agency, London; The Stevens Companies, Canada; Shuttlewood & Fanshawe, Leicester; W. R. Smith & Sons, Chester; A. C. Skinner, Sherbrooke, Que.; Simmons & Co., London; Walter H. Schreiber, Secretary and General Manager, Canadian Potato Machinery Co., Ltd., Galt, Ontario; British Trade Review; Canadian Druggist; British Pharmacopoeia; Nottinghamshire Guardian; London Daily Express; Edward Lloyd, Ltd. (Newspaper Properties), London; Henry Yates Thompson (former proprietor of Pall Mall Gazette), London; D. Venkayya, Merchant, Chirala, Madras Presidency, India; Vickers & Hine, Ltd., Nottingham; Herbert E. Robbins (Comptometer Co.); London; E. D. Sassoon & Co. (Merchants), London; Salt Union, Ltd., Liverpool; The Scottish Tube Co., Ltd. (Tube Manufacturers), Glasgow; Shibakawa & Co., Ltd., Importers and Exporters, London; Charles Southwell & Co., Ltd. (Manufacturing and Export Confectioners), London; Spirella Co. of Gt. Britain, Ltd. (Corset Manufacturers); Swan & Edgar, Ltd. (Silk Mercers), London; Tom Smith & Co., London; James Scott & Sons (Timber Merchants); Shaw Adams & Co. (Shipowners); T. Smith (Worsted Spinner); Sinnott & Co. (Wool Staplers); J. Sainsbury (Provision Merchant), London; Geo. Slater & Co. (Manufacturers of Spring Balances), West Bromwich; Rt. Hon. Sir Edgar Speyer, Bart., P.C. (Merchant), London; Sir D. M. Stevenson, Bart. (Coal Exporter), Glasgow; The Shepshed Lace Manufacturing Co., Ltd., Loughborough; Standley, Belcher & Mason, Ltd. (Manufacturers Pure Acids, etc.), Birmingham; The "Sanitas" Co., Ltd. (Disinfectant Manufacturers), London); The Sterling Telephone & Electric Co., Ltd., London; George Senior & Sons, Ltd., Ponds Forge, Sheffield; South Africa Manufacturers' Association; William Teacher & Sons, Ltd. (Distillers), Glasgow; John Tullis & Son, Ltd. (Leather Manufacturers); Teetgen & Co., Ltd. (Tea Merchants); Trechmann, Carrick & Co. (Shipbrokers); Sir John Turney, M.I.M.E. (Leather Works); Transvaal Manufacturers' Association (South Africa); Union Corporation, Ltd. (Merchants), London; Ulster Tin Co., Ltd., Belfast; Vulcan Globe Match Co., Ltd., London; Richard B. Vick (Timber Merchant), London; Waring & Gillow, Ltd. (General Furnishers); J. T. Whipp (Cotton Spinner); A. W. Whitley (Cotton Spinner); W. Welsh (Woolen Manufacturer); A. Westland (Tweed Manufacturer); Charles Walker & Thomas, Ltd. (Tea Merchants); Williams, Starkey & Co. (Merchants), London; Watmough & Son (Biscuit Manufacturers), Grimsby; George Watson & Co. (Wholesale Paper Merchants), London; C. P. Wills (Merchant and Shipper), London; A. W. Wills & Son (Manufacturers),

Birmingham; Yardley & Co., Ltd. (Soap Manufacturers), London; Whyte, Deans & Whyte, Belfast; H. Williamson, Ltd., London; C. J. Winston, Melbourne Chair Co., Pty., Ltd., Collingwood, Melbourne, Australasia; Austral Bronze Co., Ltd., Sydney; The Wexford Engineering Co., Ltd., Wexford; John Wilkins & Co., Clerkenwell; Henry Wells Oil Co., London; Western Commercial Co., Ltd., Calgary, Alta.; Walker Brothers, Limited, Walsall; Thomas Welsh & Co., Ltd., Liverpool; Walter H. Welshman, Wolverhampton; West Carclase China Clay, Cornwall; Arthur Roose, Wadleigh Co., Ltd., Rubber and Produce Merchants, Singapore; Argentine Great Western Railway Co., Ltd.; E. G. Acheson, Ltd. (Manufacturers), London; Anglo-Austrian Bank; Holdsworth, Lund & Co., Bradford; Horrockses, Crewdson & Co., Ltd. (Cotton Spinners), Manchester and London; Husband, Snelling & Co. (Commission Agents), London; Hudson, Sykes & Bousfield, Ltd., Leeds; J. Thomas & Co., Ltd., Manchester; Thomas Pinckney & Sons (Shipping Auctioneers), Sunderland; Mabie, Todd & Co., Ltd. (Makers of Swan Pens); Morison, Pollexfen & Blair (Ship Insurance Brokers), London; A. Barton Kent (G. B. Kent & Sons, Brushmakers), London; Salomon & Co. (Bankers), London; J. Thorne, Manager, Union Bank of Canada, Melfort, Canada; Lazard Brothers & Co. (Bankers), London; Taylor's Typewriter Co.; J. Lionel Barber & Co., Ltd. (South American Bankers), Liverpool; H. M. Elliott (Bank Manager), Sheffield; R. H. Foà (Banker), Kent; Sir R. V. Vassar-Smith (Chairman of Lloyd's Bank), London; Lord Kinnaird (Banker), London; O. V. G. Hoare, London (Director of Cox's Bank); Institute of Bankers, London; Imperial Bank of Persia, London; International Banking Corporation, London; E. W. Keenleyside, Provincial Manager, North American Life Assurance Co., Vancouver, B. C.; London Electric Railway Co.; Municipal Tramways Association, Bradford; Western Canada Mining, Engineering and Contracting Co., Vancouver, B. C.; B. W. Blydenstein & Co., London; Buenos Great Southern Railway Co., Ltd.; H. J. Ryman, Ltd. (Printers); Sir Alfred W. Smithers, M.P. (Chairman of Grand Trunk Railway of Canada), London; Chas. de Pury (Chief Accountant, London Brighton and South Coast Railway); Corporation Tramways, Glasgow; Hugh Reid, Chief Managing Director, North British Locomotive Co., Ltd., Glasgow; Francis Voules & Co. (Solicitors), London; Theodore McKenna (Solicitor), London; Major & Co. (Tar Distillers and Chemical Manufacturers), Hull; Edmund K. Muspratt (Manufacturing Chemist), Liverpool; A. Boake, Roberts & Co., Ltd. (Chemical Manufacturers), London; J. T. Davenport, Ltd. (Manufacturing Chemists), London; Baird-Taylor Bros., Glasgow; Theodore Butler, Ltd., U. S. A. and England; A. S. Cavell, Son & Co., Ltd., Bristol; The Viscount Cowdray (President of S. Pearson and Son), London; Morris, Carswell & Co., Ltd., Glasgow; Sir J. Cargill (Burmah Oil Company), Glasgow; Spencer, Chapman & Messel, Ltd. (Chemical Manufacturers), London; Credit Lyonnais, London; Thos. Cook & Co., London; Elliman, Sons & Co., Slough; William Livingston, Lurgan, Ireland; Adams Nitro-Phosphate and Chemical Co., London; The Air Navigation & Engineering Co., Ltd., Addlestone (Surrey); American Radiator Company of Canada, Ltd., John D. Kelly, Plant Mgr., Brantford, Ont.; Carey Brothers, Mullingar; Arundel & Company, Stockport; James Ashmore, Dublin, Ireland; Australian Meat Co., Ltd., London; Austin Motor Co., Ltd., Birmingham; and thousands of others.

British Xylonite Company, Limited: "This company adopted the Metric System in 1905. . . . The simplicity of the system has been such

that we should not think of changing, and all our people now using the system are quite converts to the Metric System."

Prudential Assurance Co. (London): "We think it very desirable that the British Isles should adopt a Decimal System of weights and measures, but we think it advisable that the change in the basis of the currency should have precedence."

Harrods' Stores Limited (London), per Chief Accountant: "The Decimal System of coinage will assist the introduction of the Metric System of weights and measures, which we also strongly advocate."

James W. Davidson, Vice-President, Beiseker and Davidson, Ltd., Calgary, Canada (12 May, 1919): "As a member of the American Consular service under Presidents Cleveland, McKinley and Roosevelt, I had somewhat of an unusual opportunity of knowing the injury done to American Commerce by retaining the old system of weights and measurement when practically all the balance of the world, with the exception of Great Britain, had adopted a simple, scientific, economical and efficient metric system.

"This is a period of change and improvement and no undertaking would do you greater credit than to further legislation along this line.

"It can be easily proven that the introduction of a metric system would save annually millions of dollars and release literally millions of hours of labor, which could be converted into useful work."

Colonial Merchants, Limited, Exporters and Importers, London: "We are fully aware of the advantages to be derived from the adoption of meter-liter-gram."

Frank R. Perrot, Machinery Merchant, Perth, British Isles: "We feel strongly that the adoption of the Meter-Liter-Gram has already been too long delayed by Britannia and America, and we wished we knew of some method by which we could enforce a change immediately."

Arthur H. Cox & Co., Ltd., Brighton, British Isles: "We are in favor of the introduction of metric weights and measures in place of our present complicated system. We are practical enough to believe that what other nations have done without extra expense and inconvenience can be accomplished by Englishmen."

John T. Kidson, Director and Chairman, Thomas Kidson & Sons, Ltd., Provision Merchants, Willenhall: "We are fully convinced of the incalculable advantage this would be in the world's commerce."

Selfridge & Co., Ltd. (London): "We think the decimal weights and measures almost as important as the currency. It would be comparatively simple for us to adopt the Continental weights and measures, and if we did it here, no doubt the United States would quickly follow."

"Canadian Farm Implements," thru A. A. Thomson, Editor: "In regard to the adoption of the Metric System as standard measurement in both Canada and the United States, you may be assured that we will give our editorial co-operation in any way whatsoever to attain this end, as the present system of weights and measures in this continent, as in Great Britain, is idiotic, making the computation of quantities an unnecessarily hard mathematical problem."

ENGINEERS, ARCHITECTS, AND SURVEYORS

(British Isles, unless otherwise stated.)

Association of Mining Electrical Engineers (Yorkshire Branch); Aveling & Porter; Aston Tube Works; Albion Iron Foundry Co., Ltd.; W. & T. Avery, Ltd. (Engineers, Scale and Weight Makers), Birmingham; Accles & Pollock, Ltd. (Steel Tube Makers), Birmingham; R. M. Archer, M.I.E.E., London; W. H. Allen, Son & Co., Ltd. (Engineering Works), Bedford; Edgar Allen & Co., Ltd. (Steel Works), Sheffield; L. B. Atkinson, A.M., Inst. C.E., M.I.E.E. (Consulting Engineer), London; A. S. E. Ackermann, A.M. Inst. C.E., M.S.I., B.Sc. (Eng. Lond.), London; Sir W. J. Armstrong Whitworth & Co., Ltd., Newcastle-on-Tyne; Babcock & Wilcox, Ltd., London; Prof. Burstall, Prof. of Engineering at Birmingham University; Brampton & Sons, Ltd.; Birmingham Small Arms Co.; James Booth & Co., Ltd.; Bute Shipbuilding & Dry Dock Co., Ltd.; British Thomson-Houston Co., Ltd. (Electrical Engineers), Rugby; Braithwaite & Kirk (Structural Engineers), London; Birks & Lockwood, Ltd. (Steel Manufacturers), Sheffield; British Electrical Federation, Ltd., London; British Electrical and Allied Manufacturers' Association, Ltd., London; Sir Chas. Bright, F.R.S.E., M. Inst. C.E., M.I.E.E; Roberts Beaumont, M.Sc., M.I.M.E., Leeds; Belfast Association of Engineers; British Chuck & Piston Ring Co., Ltd., Coventry; Cobbet Barker (Brass Founder); T. Birkett Barker, M.I.M.E., Warwickshire; British Electric Plant Co., Ltd., Glasgow; British Insulated & Helsby Cables Ltd., London; British Mannesmann Tube Co., Ltd., London; British Westinghouse Engineering & Man. Co., Ltd., Manchester; Brush Electrical Engineering Co., Ltd., London; Thomas Bolton & Sons, Ltd.; Benton & Stone (Brass Founders), Birmingham; British Engineers' Association, London; The Baldwin Locomotive Works, Philadelphia and London; Council of Surveyors' Institution; Cleveland Bridge Co.; Lt.-Col. E. Kitson Clark (Manufacturing Engineer), Leeds; Coventry Engineering Society; Central Marine Engine Works, West Hartlepool; Cochrane & Co., Ltd. (Ironmasters), Middlesbrough; David Colville & Sons, Ltd. (Steel and Ironworks), Motherwell; District Iron & Steel Co.; Sir Horace Darwin, K.B.E., A.M. Inst. C.E., M.I.M.E., Cambridge; Frank A. Dixon (Isaac Braithwaite & Son), Engineer, London; William Doxford & Sons, Ltd. (Ship Builders), Sunderland; Samuel Denison & Son, Ltd., Leeds; Eagle Range & Gas Stove Co., Ltd.; Sir H. Trustram Eve (Surveyor), London; R. B. Askquith Ellis, A.M.I.M.E., Birmingham; Fawcett, Preston & Co., Liverpool; Sir Douglas Fox, Sons & Partners, London; Sir Maurice Fitz-Maurice, C.M.G., F.R.S.M. Inst. C.E., late President of Institution of Civil Engineers, London; Sir J. Fortescue-Flannery, Bart., M.P., M. Inst. C.E., &c., London; D. Landale Frew, Glasgow; Gittings, Hills & Boothby, Ltd., Birmingham; George & Jobling (Motor Car Agents and Engineers), Newcastle-on-Tyne; Hoffman Manufacturing Co.; Hans Renold, Ltd., Manchester; Sir Robert A. Hadfield, Bart., F.R.S., M. Inst. C.E., M.I.M.E., Sheffield; H. M. Hobart (Electrical Engineer), New York; Hugo Hirst (General Electric Co., Ltd.), London; Hurst, Nelson & Co., Ltd. (Rolling Stock and Plant Works), Motherwell; W. Crosier Hayne (Surveyor), London; Sir Geo. B. Hunter, K.B.E., D.Sc., M. Inst. C.E. (Shipbuilder), Wallsend-on-Tyne; Institute of Sanitary Engineers; Jointless Rim, Ltd., Birmingham; Walter Jones, Senior Director, Jones & Attwood, Ltd. (Heating and

Hydraulic Engineers); Prof. Kapp (Prof. of Engineering at Birmingham University); Kelvin & James White, Ltd., Glasgow and London; James R. Kelly & Co., Ltd. (Engineers and Machinery Merchants), Leeds; W. F. Leeson, Director, Peninsular Engineering Co., Ltd., London; F. Howard Livens, M. Inst. C.E., M.I.M.E., Lincoln; Loveridge, Ltd. (Engineers and Ship Furnishers), Cardiff; A. R. MacDonald, British Engineer, Torquay, France; Manchester Engineers' Club; Mather & Platt, Manchester; E. R. Mathews, Consulting Engineer, London; Mount Stewart Dry Dock Co., Ltd.; The Michelin Tyre Co., Ltd., London; W. L. Madgen, M.I.E.E., London; Sir Guilford L. Molesworth, K.C.I.E., M. Inst. C.E., M.I.M.E., Kent; Herbert E. Moore, Engineer, Cape Town, South Africa; George A. Mower, M.I.M.E., London; Mavor & Coulson, Ltd. (Engineers, Electricians), Glasgow; North Eastern Marine Engineering Co., Wallsend; New Hudson Cycle Co., Ltd., Birmingham; North British Locomotive Co., Ltd. (Engineers), Glasgow; Perfecta Seamless Steel Tube Co., Birmingham; Pulsometer Engineering Co., Ltd., Reading; H. Faraday Proctor, M. Inst. C.E., M.I.E.E., Bristol; Hon. Sir Chas. Algernon Parsons, K.C.B., M.A., LL.D., D.Sc., F.R.S. (Engineer), Wylam-on-Tyne; Walter Pitt, M. Inst. C.E., M.I.M.E., Bath; Henry Rossell & Co., Sheffield; Rudge Whitworth, Ltd., Coventry; Ruston Hornsby & Co., Lincoln; David Rollor & Sons, Liverpool; F. Royce (Rolls Royce), Chichester; Rownson, Drew & Clydesdale, Ltd. (Iron Merchants, Engineers), London; Shipbuilding Employers' Federation, London; Siemens' Bros. & Co., Ltd., Woolwich; Swan, Hunter & Wigham Richardson, Ltd., Wallsend; Stothert & Pitt, Bath; Sir David Salomons, Bart., past Vice-President of Inst. Electrical Engineers; Thomas Sumner & Sons, Liverpool; Sturtevant Engineering Co., Ltd., London; Walter Spencer (Steel Works), Sheffield; Capt. H. R. Sankey, R.E., M.I.M.E., London; A. J. Stubbs, M. Inst. C.E., M.I.E.E. (Assistant Engineer-in-Chief to G.P.O.), London; J. Swinburne (Engineer), London; Gerald Stoney, M. Inst. C.E., M.I.E.E., Newcastle-on-Tyne; H. D. Searles-Wood, F.R.I.B.A. (Surveyor and Architect), London; Tyne Shipbuilding Co.; Col. W. Thomlinson (Seaton Carew Iron Co.), West Hartlepool; C. Turnbull, M.I.E.E. (Corporation Electricity Works), North Shields; Teasdale & Co., Ltd. (Hydraulic and Sanitary Engineers), London; Sir Richard Threlfall, K.B.E., M.I.E.E., A.M. Inst. C.E., F.R.S., F.C.S. (Electro-Chemist), Birmingham; Sir John I. Thornycroft, F.R.S., LL.D. (Shipbuilder), Isle of Wight; Vickers, Ltd. (Sheffield), Engineers; Veritys, Ltd. (Electrical Engineers), Birmingham; West of Scotland Iron & Steel Institute.

ORGANIZED LABOR

(British Isles)

Amalgamated Engineers' Club and Institute; Amalgamated Plumbers' Society; Aberdare Trades' and Labour Council; Abertilly (Mon.) Trades' and Labour Council; Amalgamated Union of Cabinet Makers; Bedford Branch of Amalgamated Society of Railway Servants; Birkenhead Trades and Labour Council; Batley Trades and Labour Council; Bradford and District Trades and Labour Council; Brighouse Trades and Labour Council; Bath and District Trades and Labour Council; Bristol Trades and Labour Council; Bookbinder's Society; Coventry Trades and Labour Council; Chatham and District Trades and Labour Council; Carlisle Trades and

Labour Council; Cardiff Trades and Labour Council; Durham Miners' Association; Darwen Trades Council; Dundee and District United Trades and Labour Council; Electrical Trades Union; Edinburgh, Leith and District Trades and Labour Council; French Polishers; Fifeshire Cloth Lappers' and Finishers' Association; Goldsmiths' Trade Union; Gorseinon and District Trades Council; Gloucester Trades and Labour Council; Govan and District United Labour Council; General Federation of Trade Unions; Hosiery Trades Union; Hull Trades and Labour Council; Heywood and District Trades Council; International Federation of Trades Unions; London Society of Compositors; London Silver Spoon and Fork Finishers' Trade Society; Lancashire Federation of Trades and Labour Councils; Middleton and District Trades and Labour Council; Manchester Trades Council; National Society of Operative Printers' Assistants; National Operative Plasterers; Newport (Mon.) Trades Council; Newport (Mon.) Trades and Labour Council; Norwich Trades and Labour Council; Newark and District Trades and Labour Council; Northampton Trades Council; Northampton Boot Operatives' Union; Postmen's Federation, Woolwich; Portsmouth Trades and Labour Council; Paisley United Trades and Labour Council; Reading Trades and Labour Council; Railway Clerks' Association, London; South Western Counties Federation of Trades Councils; Sunderland and District Trades and Labour Council; S. W. District (London) United Trades and Labour Council; Sheffield Trades Union Congress; Shipley Union Congress; Shields and District Union Congress; Scottish Floorcloth and Linoleum Printers' Union; Trades Union Congress; Trades Union Congress Parliamentary Committee; Weston-Super-Mare Trades Council; Woolwich Explosives Workers' Union; Yeovil Trades Council; York Labour Party.

EDUCATION

(British Isles, unless otherwise stated.)

Association of Head Mistresses; Aberdare School Board; Acton School Board; Alston, Cumberland, School Board; Arnold, Notts., School Board; Aston School Board; Ashbourn and District Teachers' Association; Anglesea and District Teachers' Association; Wm. Alexander, Esq., Lecturer on Engineering, Glasgow University; George Adami, Vice-Chancellor, University of Liverpool; Aberdeen Grammar School, Rector and Masters; Banbury Education Committee; Bristol Education Committee; Barnsley School Board; Barrowford, Lancs., School Board; Barry, Glam., School Board; Batley School Board; Bedford School Board; Bedwellty School Board; Birkenhead School Board; Birmingham School Board; Blackburn School Board; Bolton School Board; Bradford School Board; Bramhall, nr. Stockport, School Board; Brighton School Board; Burnley School Board; Burslem School Board; Burton-on-Trent School Board; Buxton School Board; Brighton, Hove and District Association; Braintree Teachers' Association; Burton and District Teachers' Association; Birkenhead Teachers' Association; Bradford Teachers' Association; Bishops Stortford Association; Ballineen and Enniskeane N.T.A.; Ballymitty N.T.A.; Ballymoney N.T.A.; Ballyfarnon and Drumshanbo N.T.A.; J. Bolam, Esq., Principal, Leith Technical College; H. Bamford, Esq., Lecturer on Engineering, Glasgow University; Bedfordshire Education Committee; Prof. Aldred F. Barker (Prof. of Textile Industries), Leeds University; Prof. F. O. Bower, F.R.S. (Regius

Prof. of Botany), University, Glasgow; Cardiff Education Committee; Carnarvon School Board; Carlton, Notts., School Board; Colne, Lancs., School Board; Coventry School Board; Croydon School Board; Chatham, Rochester and District Association; Cardiff and District Teachers' Association; Carndonagh Teachers' Association; Cashel Teachers' Association; Cookstown Teachers' Association; Castle Island Teachers' Association; Carrickfergus Teachers' Association; Clonmel Teachers' Association; Sir S. J. Chapman (Prof. of Economics, Manchester University); Devon County Education Committee; Darlington Education Committee; Denbighshire Education Committee; Dewsbury Education Committee; Derby School Board; Devonport School Board; Dudley School Board; Dudley and District Association; Deeside Branch Educational Institute of Scotland; Downpatrick Teachers' Association; Derry District Teachers' Association; Head Master and Masters' of Dulwich College; East Ham Education Committee; Edmonton Education Committee; Enfield School Board; Exeter School Board; Enniscorthy Teachers' Association; E. Cavan and S. Monaghan Teachers' Association; The Educational Institute of Scotland; C. W. Edkins, M.A., LL.D., (Schoolmaster), Nottingham; Sir Charles Eliot, K.C.M.G., LL.D. (Principal of Hong Kong University); Federation of Education Committees of Wales and Monmouthshire; Festiniog Association; Gravesend School Board; Great Yarmouth School Board; Guisborough School Board; Greenwich District Teachers' Association; Glenarm and Larne Teachers' Association; 213 Headmasters of Public Schools; Hull Education Committee; Hendon Education Committee; Halifax School Board; Hastings School Board; Heckmondwike School Board; Huddersfield School Board; Hull School Board; Hove Education Authority; Horsham, Henfield and District Teachers' Association; Hornsey Teachers' Association; J. B. Henderson, Esq. (Lecturer on Electrical Engineering, Glasgow University); Edinburgh, Principal and Lecturers of Heriot Watt College; Incorporated Association of Headmasters in Secondary Schools, British Isles; Incorporated Association of Assistant Masters, British Isles; Ilford Education Committee; Ipswich School Board; Jarrow Education Committee; Keighley Education Authority; Kempston, Beds. Education Authority; J. Graham Kerr, Esq. (Prof. of Zoology, Glasgow University); London Teachers' Association; Lincoln Education Committee; Leicestershire Education Committee; Leyton Education Committee; London Education Committee; Leeds School Board; Longton School Board; Ludgvan, Cornwall, Education Committee; Luton Education Committee; London (West) Suburban Teachers' Association; Lurgan Teachers' Association; Liverpool University Professors and Lecturers; Sir Oliver Lodge, F.R.S., LL.D. (some time Principal of Birmingham University), Birmingham; Mathematical Association, Great Britain; Mansfield Education Committee; A. H. McKay, Superintendent of Education, Halifax, Nova Scotia; Middlesbrough Education Committee; Macclesfield School Board; March School Board; Merthyr Tydfil School Board; Mitcham School Board; Millom and District Teachers' Association; Mid-Devon Teachers' Association; Maldon Teachers' Association; Moreton-in-Marsh Teachers' Association; Merthyr Tydfil Teachers' Association; Mountrath Teachers' Association; Maryborough Teachers' Association; Prof. Magnus Maclean (Demonstrator in Engineering, Glasgow University); Sir Donald MacAlister, K.C.B., M.A., M.D., F.R.C.P. (Principal of Glasgow University); National Union of Teachers, British Isles; National Association of Head Teachers, British Isles; Newhaven School Board; Newport (Mon.) School

Board; Norwich School Board; Nottingham School Board; North Pembroke Teachers' Association; North Dorset Teachers' Association; Navan Teachers' Association; North Tipperary Teachers' Association; J. S. Nicholson, Esq. (Demonstrator in Engineering, Glasgow University); Okehampton School Board; Oldham School Board; Over, Cheshire, School Board; D. V. Payen-Payne (Principal of Kensington Coaching College), London; Pembrokeshire Education Committee; Pontypridd Education Committee; Plymouth School Board; Prof. W. Mollwo Perkin, F.R.S., London; Reading School Board; Rochdale School Board; Rochester School Board; Rotherham School Board; Ryde School Board; Radstock and District Teachers' Association; Rhondda Teachers' Association; Rathfornham Teachers' Association; Sir Wm. Ramsay, K.C.B., F.R.S., University College, W.C.; Rev. Dr. G. H. Rendall (Headmaster), Sussex; Sir Henry R. Reichel (Principal of University College of N. Wales), N. Wales; Col. Sir R. Ross, K.C.B., F.R.S., F.R.C.S., D.P.H., University, Liverpool; Scottish School Board Association; Stoke-on-Trent Education Committee; Swansea Education Committee; Shipley Education Committee; Stretford Education Committee; Salford School Board; Seacombe School Board; Sedglet, Staffs., School Board; Sheffield School Board; South Shields School Board; Southend-on-Sea School Board; Stanwix, nr. Carlisle, School Board; Stoke-on-Trent School Board; St. Ives School Board; Swadlincote School Board; South African Teachers' Association; Staffordshire Teachers' County Association; Saltash-Callington Teachers' Association; Sheffield Teachers' Association; Transvaal Teachers' Association, United South Africa; Torquay Education Committee; Torridge District Teachers' Association; Teign and Dart Teachers' Association; Co. Tipperary Teachers' Association; Prof. Wm. A. Tilden, D.Sc., F.R.S., President of the Chemical Society, London; Directors and Lecturers of Technical College, Glasgow; United Free Church Training College, Edinburgh, Rector and Lecturers; West Suffolk Education Committee; Worthing Education Committee; Wakefield School Board; Walsall School Board; Walthamstow School Board; Wednesbury School Board; West Bromwich School Board; West Ham School Board; West Hartlepool School Board; Weston-Super-Mare School Board; Whitstable School Board; Widnes School Board; Wigan School Board; Willesden School Board; Wolverhampton School Board; Workington School Board; Worsborough School Board; Worcester Teachers' Association; Prof. J. Wertheimer, B.Sc., B.A., Principal, Merchant Venturers' Technical College, Bristol; Workers' Educational Association, London; R. M. Walmsley, D.Sc., Northampton Polytechnic, London; Witwatersrand Central School Board (South Africa); Witwatersrand Council of Education; Yorkshire Education Committee (North Riding and West Riding); Prof. S. Young, D.Sc., F.R.S., Trinity College, Dublin; and thousands of others.

British Urge Meter-Liter-Gram

It should be noted that many other organizations, concerns and individuals thruout Britannia are listed elsewhere in this volume, with strong statements of support for gradual metric standardization of weights and measures. Attention is drawn particularly to the list of British members of the World Metric Standardization Council, in Chapter 7; and to the British authorities cited in Chapter 10, "What Will Metric Standardization Cost?"

Chapter 14, "Look It Up," lists many British publications, including those with the imprint of the British Decimal Association. British Parliamentary reports, accounts and papers having bearing on metric standardization, are also indexed. (See pages 467-469.)

Reference should be made particularly to the pages of the "Decimal Educator," the valuable magazine published by the British Decimal Association. This magazine contains much up-to-date and current evidence as to the vital need for uniformity of weights and measures on the world metric basis.

In view of all this conclusive testimony, the insistent urge for metric units thruout Britannia is not to be denied.

The basis for British public opinion rests upon the irrefutable logic of such arguments as are presented in the historic Parliamentary Report which makes up the next chapter.

CHAPTER 12

A MONUMENTAL METRIC REPORT

Rendered By British Parliamentary Committee, 1862

THE survey which has just been made in the preceding chapter, showing the steady trend toward metric standardization thruout the British Commonwealths, makes it particularly appropriate that there should be reproduced here a classic report on the Metric System made by a committee of the House of Commons, British Isles. This committee, in 1862, urged *unanimously* that the British adopt the world units for weighing and measuring. Their advice was not taken then; and history has proved that this failure on the part of the British people has been indeed "a monumental mistake."

The Report of 1862, reprinted here, is essentially as true today as when it was written. Why was not such good advice taken then? Will we not now avail ourselves of this notable research and apply it to our present conditions?

This is a document well worthy the attention of all investigators of world standardization:

Report from the Select Committee on Weights and Measures, ordered by the House of Commons, British Isles, to be printed, 15 July, 1862.

(Sessional Papers, 1862, Volume 7, Commons)

THE SELECT COMMITTEE appointed to consider the Practicability of adopting a Simple and Uniform System of Weights and Measures, with a View not only to the Benefit of our Internal Trade, but to facilitate our Trade and Intercourse with Foreign Countries:—Have considered the Matters to them referred, and have agreed to the following REPORT:—

ON a subject of such general importance to nations as well as individuals, your Committee have taken advantage of the opportunity afforded by the International Exhibition, to obtain the opinions, and profit by the experience, of enlightened foreigners, who have studied the question of Weights and Measures, and assisted in reforming them in their several countries. The Committee feel indebted to these eminent persons—at the head of whom may be placed M. Michel Chevalier—for their valuable

testimony, which was not more willingly accepted than spontaneously and liberally given.

Your Committee have also examined men of science, merchants, manufacturers, and working men belonging to our own country. **They have sought for advocates of the existing system, but they have found it difficult to discover them.**

The great diversity of Weights and Measures which has existed in all countries has principally arisen from the lesser communities of which they were originally composed having each adopted its own system. In process of time these lesser communities were amalgamated into separate nations, with whose increase of population and trade the inconvenience of a variety of Weights and Measures soon made itself apparent, and the desire of establishing **uniformity** arose. France was the first country to relieve itself from its barbarous multiplicity of weights and measures, by adopting a uniform system. Louis the XVI., at the recommendation of the Constituent Assembly, invited, by a decree, all the nations of Europe, and particularly the King of Great Britain, to confer respecting the adoption of an international system of Weights and Measures. No response being given to this invitation, France committed the consideration of the subject to some of the most learned men of the age, who devised what is called the Metric system;[1] the most simple, convenient, and scientific system of weights and measures in existence.

Confusion of British Weights and Measures

In this country (British Isles), a standard of uniformity existed before the Conquest. It was enacted in the time of Richard I., and declared by Magna Charta, that there should be one weight and one measure throughout the realm. In more recent times, committees and commissions have been appointed to inquire into the practicability of introducing a more simple and uniform system of weights and measures, as well as a system of decimal coinage. Several Acts have been passed for the purpose of enforcing or promoting **uniformity**, the last among the leading statutes being the 5 and 6 Will. 4, c. 63.

The silent influence of usage has baffled the decrees of legislation; and we are still far distant from the **uniformity** at which we have so often, yet so vainly, aimed. Omitting many specific

[1] James Watt suggested the logical inter-related scientific units of weights and measure, which became meter-liter-gram. "The complexity of measurements greatly handicapped the work of our great British inventor, James Watt, who found the need of world-wide terms for the expression of quantities. His scientific and practical mind devised a simple decimal method which he submitted to various countries in 1783, and it was his suggestion that became the metric system. He called it the meter-liter-gram, which included the 3 principal units of the measurements of length, capacity and weight."—Howard Wall, "Story of the Evolution of British Measures," p. 77. (London; Talbot & Co.; 1919.) The works of Howard Wall, Limited, in London, British Isles, are makers of measures, produced under the brands of Dean & Bedington. This concern is a member of the World Metric Standardization Council.

anomalies, we have no less than 10 different systems of Weights and Measures, most of them established by law. Our Neighbours, the French, and many other nations, have only one, founded on the metre, which is a near approximation to the English yard. We find, in our country, the following different systems:

1. Grains, computed decimally, used for scientific purposes.
2. Troy weight, under 5 Geo. 4, c. 74, and 18 & 19 Vict. c. 72.
3. Troy ounce, with decimal multiples and divisions, called bullion weights, under 16 & 17 Vict. c. 29.
4. Bankers' weights, to weigh 10, 20, 30, 50, 100 and 200 sovereigns.
5. Apothecaries' weight.
6. Diamond weights and pearl weights, including carats.
7. Avoirdupois weight, under 5 Geo. 4, c. 74, and 18 & 19 Vict. c. 72.
8. Weights for hay and straw.
9. Wool weight, using as factors, 2, 3, 7, 13, and their multiples.
10. Coal weights, decimal, under 1 & 2 Will. 4, c. 76, and 8 & 9 Vict. c. 10; numbers 1, .5, .2, .1, .05, .025.

We have also, in occasional scientific use, the weights of the Metric system. For measures of length, we have the ordinary inch, foot, and yard. We have in cloth measure, yards, nails, and ells. There are 4 different sorts of ells. For nautical purposes, we have fathoms, knots, leagues, and geographical miles differing from the common mile. The fathom of a man-of-war is 6 feet; of a merchant vessel, 5½ feet, of a fishing-smack, 5 feet. We have also the Scotch and Irish mile, and the Scotch and Irish acre. There are several sorts of acres in the United Kingdom, and there are a great variety of roods. We have, in almost every trade, measures of length especially used in those trades: for the measurement of horses, we have the hand; shoemakers use sizes; and we are compelled to adopt gauges where the French use the millimetre. These gauges are entirely arbitrary. The custom of the trade is the only thing which would decide the question, in case of dispute. For measures of capacity, we have 20 different bushels; we can scarcely tell what the hogshead means. For ale it is 54 gallons, for wine 63. Pipes of wine vary in many ways; each sort of wine seems to claim the privilege of a different sort of pipe. For measures of weight, we have about 10 different stones: a stone of wool at Darlington is 18 lbs.; a stone of flax

at Downpatrick is 24 lbs.; a stone of flax at Belfast is only 16¾ lbs., but it is also at Belfast 24½ lbs., having in one place 2 values. The hundred weight may mean 100 lbs., 112 lbs., or 120 lbs. If you buy an ounce or pound of anything, you must inquire if it belongs to Dutch, troy or avoirdupois weight. But it is needless to lead the reader through all these mazes of numerical confusion. Fuller particulars will be found in the evidence of Professor Levi, Mr. Fellows, and other witnesses.

Need for World Uniformity Seen

Our system of Weights and Measures being in this state of disorder and of darkness, a sudden light was thrown upon it, and the advantage of a common international system fully brought into view, by the Great Exhibition of 1851. The jurors of that Exhibition experienced the greatest embarrassment from the various Weights and Measures used by the exhibitors of different countries. They could with difficulty arrive at any common standard. This induced the Society of Arts to petition the Treasury in favour of a uniform system. The same object was promoted by the Statistical Congress held at Brussels in 1853. When the Great Paris Exhibition of 1855 took place, the jurors found themselves obstructed by similar impediments. The members of the international jury, on that occasion, issued an important declaration, recommending the adoption of a universal system of Weights and Measures. At the London meeting of the International Statistical Congress held in 1860, His Royal Highness, the ever-lamented and ever-memorable Prince Consort, in his opening address, used these words: "The different weights, measures, and currencies, in which different statistics are expressed, cause further difficulties and impediments; suggestions with regard to the removal of these have been made at former meetings, and will, no doubt, be renewed." All these occurrences led to repeated discussions at the Society of Arts and other Institutions, respecting the best system of Weights and Measures. At these meetings the preponderance of opinion was strongly in favour of the Metric system, now becoming common to so many nations. The **Associated Chambers of Commerce of the United Kingdom,** at their annual meeting in 1861, speaking as delegates on behalf of their various districts, and representing some of the most important towns in the country as well as various branches of industry, unanimously passed the following resolution: "It is highly desirable to adopt the Metric system which has been introduced into many European countries with great advantage to the saving of time in trading and other accounts."

There appear to be 3 modes of proceeding before us: 1, to retain the present system; 2, to create a separate decimal system of our own, distinct from that of other nations; 3, simply to adopt, in common with other countries, the Metric decimal system. **Scarcely any witness examined by your Committee has defended the present system.** Even apart from the anomaly of using so many weights and measures, that system has been **condemned** as cumbrous and inconvenient. The units are founded on no natural basis. They are not decimally related to each other. Their multiples and divisors follow no given ratio; and the best proof of their insufficiency for all the practical purposes of life is found in the adoption of so many systems better suited to their wants, by different classes of the people. The superiority of a decimal system has long been acknowledged. Our engineers have, for a considerable time, made use of one. The decimal measuring-chain and decimal levelling staff are instruments familiar to them. Insurance companies have long employed decimals. The Equitable Insurance Company have kept their ledger on the pound and mil system for a hundred years. But it would involve almost as much difficulty to create a special decimal system of our own as simply to adopt the Metric decimal system in common with other nations; and if we did so create a special national system, we should, in all likelihood, have to change it again in a few years, as the commerce and intercourse between nations increased, into an international one.

The Metric System is Only World System

These and other considerations invite our attention to the Metric system. That system is ready made to our hands. It is complete and homogeneous in all its parts, and perfectly decimal in its multiples and divisors; it is becoming more and more an international system, at once benefiting and uniting the countries which have adopted it; by whose experience we can be guided if we choose to follow in their path.

IT is generally known that the French Metric system has the metre (the unit of length) for its basis. The litre (the unit of capacity) is derived from the tenth part of the metre (the decimetre) by cubing it. The gram (the unit of weight) is derived from a hundredth part of the metre (the centimetre) by cubing it also, and filling it with water of a given temperature. The multiples of the several units are expressed by Greek numerals, the divisors by Latin numerals. The French coinage is based on the unit of weight, the gram; the franc being equal to 5 grams; thus the whole

system, not only of Weights and Measures, but of coins also, is connected, and rests upon the metre; which is now a practically established standard, originally based on the ten-millionth part of the distance from the Equator to the Pole.

The countries[1] in which the Metric system has been, or is being, introduced, are:—

France. Belgium.
Holland.
Sardinia and Tuscany (beyond which countries it is now extending to the whole Kingdom of Italy).
Spain. Switzerland.
Portugal. Greece.
Several countries of South America.

The German Zollverein is accepting the metre instead of the foot, as its basis of length, and the half kilogram as the basis of weight. The Hanse Towns have also adopted the half kilogram[2]. Russia has intimated its readiness to follow in the same direction. It appears also that the Metric system is gradually advancing in England.

It is remarkable that the foreign witnesses concur in stating, that no nation which has adopted the Metric system has failed to derive the greatest benefit from such adoption, or after adoption, has any nation shown any desire to abandon it.

The wisdom, justice, and peaceful consequences of extending international commerce are **conspicuous reasons in favor of the general acceptance of the Metric system.** In a less comprehensive point of view, it is for our own interest to adopt it. Our commerce with the continent of Europe is probably only in its infancy; and with those countries which have admitted the Metric system it appears to be peculiarly, largely and steadily increasing.

Metric Units Promote Efficiency

The certainty and precision which **commerce** (though more especially international commerce) would derive from **uniformity** are other obvious advantages of the Metric system. Mr. Dickson, a Scotch gentleman, a large manufacturer, resident during 30 years at Dunkirk, France, ascribes his early success in France to his use of the metre as a uniform measure, **having a clear and definite meaning.** While others were using the ill-defined measures of the older system, he thus gave to his transactions that certainty which simplifies and accelerates commercial dealings. Mr. Henley, M.

[1] This was in 1862. Note the great progress which since then has been made in this particular by all the world, except the English-speaking peoples. *Now* the metric units are employed by 40 important nations, and are used more extensively than any other units by more than 200 countries. (See the Map pages at the beginning of this volume.)

[2] Germany adopted Metrics, 1871.

P., justly observes, that the continuous extension of internal communication by means of **railways**[1] increases the necessity for **uniform** terms in trade; since, as intercourse expands, it becomes more and more necessary that traders from distant parts should clearly and readily understand terms which are employed.

In **machine-making** the adoption of a decimal, but especially of the Metric, system is stated to be of great importance. The superiority of British machinery (says Mr. Fairbairn) is established by the results of the International Exhibition. As its construction becomes finer, accuracy in small measures becomes more and more necessary. "The demand for our manufacture of machinery," (says Mr. Crosley, a civil engineer), "would extend much more if an international system were adopted." Some of our machine-makers have adopted the Metric system. Mr. Fairbairn states, that "it works very well." He adds, that "when the decimal system has once been used in a machine-making establishment, he never knew of an instance of its being given up. It will ultimately be introduced into all mechanical operations. The Metric system is, of all he knows, the best." The necessity for the application of decimals to minute measurement is shown by Mr. Anderson in his account of the formation of Armstrong guns. "The millimetre," says Mr. Siemens, "is used extensively in France, and is an **exceedingly convenient** measure as a unit in mechanical construction. It induces greater precision in measurement." Mr. Crosley applies the same observation to the construction of locomotive engines and to the railway gauge.

A **saving of labour** is affected by the use of the Metric system in Mercantile establishments. Mr. Dickson, a witness already cited, says, that "under the Metric system" (which he considers **"one of the greatest blessings ever conferred on France"**) he can carry on his trade with fewer clerks than he could under the English system. M. Lorsont, a merchant and **manufacturer** in Belgium, France and England, says, that if the Metric system existed in England, he could conduct his business with a considerably diminished number of clerks, "and could **prevent a great deal of error.** An English office is made up of ready reckoners and vade-mecums, things utterly unknown abroad." "Under the Metric system," he adds, "it is much easier and shorter to make the calculations yourself." The evidence of Mr. Bass, M. P., tends to the same result.

Sir Rowland Hill states that in exchanging letters with our Colonies or with the United States of America,[2] where the system

[1] Also telegraph, telephone, radio, airplane, and helium zep.

[2] Many authorities point out the confusion caused by the considerable difference in size between the British and the American *gallon, bushel, hundredweight, ton* and so on.

of weights is **similar** to our own, no difficulties arise; but as respects most foreign countries, we are obliged to alter our scale of weights. As, however, there is no exact correspondence between our weights and those in other countries, **the loss** to our Post-Office of the postage with France amounts to 6% and with Germany to 17%. An international system of weights would obviate this loss, and greatly facilitate our postal arrangements with foreign countries.

Economy of time in education is one of the beneficial results of the Metric system. While the study of English weights and measures is **laborious and repulsive to both teacher and pupil,** anyone can easily master the Metric system. "Comparing the English system of calculation with the decimal," says M. Lorsont, "I think the difficulty of the English system is as great as it would be to make a calculation in the old Roman figures."

Metric System Easily Learnt

The Metric system is soon learnt; "any person," says Mr. Fellows, "in a quarter or in half an hour would be able to master the whole Metric system." The time which the use of a decimal system would save in education has been generally stated (on the authority of schoolmasters) to be **at least a year.** Mr. Mumford, certified Master of the British School at Highgate, describes the readiness and interest with which children have acquired it. Dr. Ihne, of the University of Bonn, conductor of a large school at Liverpool, finds his pupils, especially foreign boys, **"repelled and annoyed"** by the English system of weights and measures, and his teachers also; he states that it requires considerably more time to learn, so that a boy is prevented from ever attaining the higher position of knowledge, which he might otherwise reach, by this preliminary barrier of arithmetic. **"The waste of time,"** says the Rev. Alfred Barrett (a clergyman extensively engaged in education) "to junior pupils in learning the tables of weights and measures **is immense."** He describes the work of education in the French military academies as "much higher, and more forward than ours," and traces the cause to the time of juvenile pupils being lost in their wanderings through the mazes of our arithmetical system. That eminent mathematician, **Professor de Morgan,** thinks that **"the whole time devoted to arithmetical education, might, by adopting the decimal system, be reduced by one-half, or probably more."** "Its adoption," says Dr. Farr (superintendent of the Statistical Department in the General Register Office), "would get rid of all compound rules of arithmetic; it would make calculations simple and mechanical. Decimal log-

arithms are calculated and printed by machinery; with the vulgar fractions of our common arithmetic, this could not be done." Your Committee examined, on this part of the subject, more than one working man. There is abundant testimony to the **ease with which working men acquire the Metric system.** Mr. Dickson, already referred to, says: "In the works I carry on" (at Dunkirk, France) "I employ about 1,000 persons. I have had frequently a great many overseers from Scotland; they come not knowing the French language, far less the weights and measures or the money, but they very soon get acquainted with the Metric system." Mr. Richard Wyse has been in the employment of Mr. Brassey, as a mechanic, 25 years; he has been engaged on railways in France, Belgium, and Savoy. He states, that he very soon understood the Metric scale, and found it much easier to comprehend than the English scale of yards, feet and inches. "The English workmen," he says, "get the weights very quickly." He is asked, "How long do you think it would take them?" His answer is, "A fortnight, or a month at farthest. All the workmen I ever had anything to do with prefer the French method to the English."

Widespread Acceptance of Metric Units

But, as has been before observed, the Metric, as well as other decimal methods, have been already partly adopted in England. The Registrar General makes use of decimals, and they are about to be introduced into the Statistical Department of the Board of Trade. The pupils of the London University make their calculations by the gram. Professor Miller, of Cambridge, is asked, "How long has the Metric system been introduced in scientific operations?" He answers, "As long as I can remember. I should think that, since the year 1836, no chemist ever made use of weights which were not decimally divided." Mr. Graham, master of the Mint, states that "the divisions of the Metric system form a sort of common language for scientific men, and that where it is not used in English scientific papers" those papers remain unnoticed in France. He adds, that it is also beginning (1862) to find a place in elementary scientific works in England.

Little opposition is to be expected to the introduction of the Metric system from wholesale dealers. It is probably from the retailers that the principal obstruction would arise. To them, indeed, a change would be a considerable trial; and it is principally for them that precautionary measures are requisite. But M. Visschers (*Conseiller des Mines* at Brussels) states that the trades people in Belgium have been much benefited by it. To the small retail traders of France the ease with which it is ac-

quired and its extreme simplicity are a great advantage. "The merchants or small traders," says Mr. Dickson, "can very often scarcely sign their names," yet, owing to its simplicity, "they get on remarkably well with the Metric system"; "there is nothing so difficult to a man of imperfect education as to take an invoice of 10 tons, 3 qrs. or 7 cwts. and 18 lbs., at 25s. and 11d. the cwt.," though he "can readily understand it when it is put into kilograms and francs."

Objections have been made to the decimal method on the ground that, for common purposes, binary subdivision is more convenient, and therefore more generally resorted to. But there is nothing to prevent the use of binary subdivision side by side with decimals; all the binary divisions, as one-half, one-fourth, one-eighth, one-sixteenth, admitting of precise decimal equivalents.

World Terminology is Best

It has been much disputed whether, if the Metric system were adopted, it would be expedient to adopt also the French nomenclature, with its ascending scale based on Greek, and its descending scale based on Latin numbers. To educated persons, these terms are at once a name and a definition. But to the great mass of the people they can convey no meaning. It has been suggested that we might employ the existing terms, or other terms based on our own language. The Dutch applied their old names when they adopted the Metric system. But though to several persons this course has appeared a prudent compromise, the best authorities, the Dutch themselves who have tried it, and other witnesses, disapprove of it. "The retention of the old Dutch names," says Dr. Von Baumhauer, Professor of Chemistry at Amsterdam, "was a great error. It introduced much confusion. It would have been better to introduce the French system of nomenclature altogether." Dr. Van Eyck also, director of the Palace of Industry in Holland, and Commissioner at the International Exhibition, thinks it would have been better if the Dutch had adopted the French nomenclature; and adds, "it was a very bad thing to retain the old names." With the adoption of the Metric system therefore, it appears the sounder and simpler course to adopt its nomenclature also. . . .

AFTER full and careful consideration of the evidence, your Committee have arrived at a UNANIMOUS conclusion, that the best course to adopt is, cautiously but steadily to introduce the Metric system into this country.

Your Committee feel it to be right to add that the evidence they have received tends to convince them that a decimal system of money should, as nearly as possible, accompany a decimal system of weights and measures. Both the foreign and English witnesses think the maximum of advantage cannot be attained without a combination of the two.

Such is an outline of the course recommended by your Committee for introducing into this country a system which may tend to enlarge our foreign trade—hitherto imperfectly developed, if not neglected—with countries yearly becoming more and more mutually connected and mutually dependent; most of them composing the great European family of nations, and many of them near our own shores. Your Committee think that no country, especially no commercial country, should fail to adopt a system which will save time and lessen labour; which will give to trade greater certainty in its operations, diminish the intermediate agency with which it is encumbered, **render more exact machine-making, engineering and manufactures,** and remove a number of arithmetical barriers which stand like obstructive toll-bars, on the highway of education. It has been the destiny of this country to lead the way in introducing the great principles of commercial freedom. Let us not reject the use of those implements which may facilitate their application. Most of all, let us rejoice, if, by adopting a system freely and rapidly extending itself, and becoming more and more an international one, we may assist in promoting the **peace,** and enlarging the commerce, of the world.

15 July, 1862.

Personnel of British House of Commons' Select Committee which urged Metric Standardization in 1862:

1. **William Ewart,** Chairman, Statesman and M. P. from 1828 to 1868; Orator, Author, and Metric Advocate; Sponsor for bill of 29 July, 1864, legalizing metric units in British Isles.
2. **Richard Cobden,** Statesman and M. P. from 1841 to 1864, largely responsible for repeal of British Corn Laws; refused baronetcy and cabinet office; metric advocate, worked for more intimate world commercial relations.
3. **Sotheron Estcourt,** Statesman and M. P. from 1827 to 1865; Home Secretary in 1859.
4. **Charles Bowyer Adderley,** 1st Baron Norton, Statesman and M. P. from 1841 to 1905; President British Board of Trade, 1874 to 1878.
5. **Sir Edward Baines,** Statesman and M. P. from 1859 to 1868; author of "History of Cotton Manufacture," etc.
6. **John Wilson-Patten,** 1st Baron Winmarleigh, Statesman and M. P. from 1830 to 1874; firmly advocated all measures for benefit of British industrial population.
7. **William Henry Sykes,** F. R. S., M. P. from 1857 to 1872; naturalist, soldier and author; Chairman East India Board of Directors in 1856.

8. **William Alexander Mackinnon,** M. P. from 1830 to 1865; author of "History of Civilization," etc.
9. **William Pollard-Urquhart,** M. P. from 1852 to 1871; author; wrote chiefly on currency and agriculture.
10. **Legislator John Benjamin Smith.**
11. **Legislator Hume.**
12. **Legislator St. Aubyn.**
13. **Legislator Hennessy.**
14. **Legislator Finlay.**
15. **Legislator Greenall.**

THE 1862 committee of pre-eminent British legislators summarized the results of their work in the following statement:

"Your committee have examined men of science, merchants, manufacturers, and working men belonging to the British Isles. They have sought for advocates of the existing weights and measures, but they have found it difficult to discover them."

This committee received a large volume of letters and documents showing the **necessity** for exclusive adoption of metric units.

Pre-Eminents Who Testified Before the Committee

Evidence urging metric standardization was presented from the testimony of the following world experts:

1. **Leone Levi,** F. S. A., L. L. D., jurist and statistician; author of great work on commercial law and "History of British Commerce"; Professor of Commerce at King's College, British Isles.
2. **J. B. A. Lorsont,** merchant having offices in Belgium, France and British Isles.
3. **Frank Perko Fellows,** merchant and capitalist, Wolverhampton, British Isles.
4. **J. Anderson,** C. E., Assistant Superintendent of British Royal Gun Factory, Woolwich, British Isles.
5. **Sir Rowland Hill,** F. R. S., K. C. B., D. C. L., inventor of penny postage, Secretary Post Office of British Isles.
6. **Senor Joas Palhade Faria Lacerda,** landowner in Portugal, member Portugal Board of Trade.
7. **James Yates,** F. G. S., F. L. S., F. R. S., member of World Decimal Association, of which the President in 1862 was James de Rothschild.
8. **M. Michel Chevalier,** French Senator, French Councillor of State, Member of the French Institute, Professor of Political Economy in the College de France.
9. **Thomas Graham,** F. R. S., D. C. L., chemist and Master of the British Mint; discovered law of diffusion of gases; President of British Chemical and Cavendish Societies.
10. **Henry Wrenn,** Inspector of Weights and Measures for county of Glamorgan, British Isles.
11. **Sir William Fairbairn,** F. R. S., L. L. D., I. M. E., M. I. C. E., master civil and mechanical engineer.
12. **William Farr,** M. D., F. R. S., D. C. L., inaugurated science of "Vital Statistics"; President of British Statistical Society, Superintendent Statistical Department of the General Register's Office, British Isles.

13. **Dr. P. Bolley**, Professor of Applied Chemistry and Director of the Swiss Polytechnical School of Zurich.
14. **Sir Charles William Siemens**, C. E., F. R. S., D. C. L., L. L. D.; master of metallurgy and electricity, invented electric furnace, bathometer and electric thermometer; took out 113 patents; President of British Society of Mechanical Engineers and President of British Iron and Steel Institute.
15. **Dr. E. H. Von Baumhauer**, Professor of Chemistry, Amsterdam, Netherlands.
16. **Charles Hutton Gregory**, Esq., C. E.
17. **James Hayman**, Esq., Secretary of the Society for Promotion of the British Trading Community.
18. **William Hallowes Miller**, L. L. D., D. C. L., British Commissioner at World Commission for Standard Weights and Measures; Professor of Mineralogy at Cambridge; scientific author, developed system of crystallography.
19. **William Crosley**, Esq., C. E.
20. **C. Becker**, engineer and manufacturer.
21. **Dr. Van Eyck**, Netherlands' Commissioner to Great Exhibition, Director Palace of Industry.
22. **Rev. Alfred Barrett**, M. A., master of private school.
23. **James Mumford**, master of British school at Highgate.
24. **M. Wood**, importer and grocer of London.
25. **Thomas L. Donaldson**, President of British Institute of Architects; member of French Institute; Emeritus Professor of Architecture and Construction at University College, London.
26. **George Biddell Airy**, F. R. S., D. C. L., L. L. D., British Astronomer Royal; voluminous writings on astronomy.
27. **M. Auguste Visschers**, member of Belgian Board of Mines; member of Belgian Central Statistical Commission.
28. **A. de Morgan**, author and Professor of Mathematics at University College, London.
29. **H. Hennessy**, F. R. S., Professor in Catholic University of Dublin, British Isles.
30. **John A. Blake**, M. P. and importer.
31. **Michael Thomas Bass**, M. P., London merchant and importer; lively interest in welfare of workers.
32. **William Ihne**, Ph. D., educator.
33. **Richard Wyse**, workman.
34. **Samuel Brown**, Esq., Actuary Guardian Assurance Co.; metric advocate while joint-editor of the "Journal of the Institute of Actuaries."
35. **Dr. Charles Karmarsch**, Director of the German Royal Polytechnic Society at Hanover, Germany.
36. **Dr. Von Steinbeis**, President of the German Royal Board of Trade and Commerce, Stuttgart, Germany.
37. **J. W. Henley**, Statesman and M. P. from 1841 to 1878; declined Home Office, 1866; President of British Board of Trade.
38. **David Dickson**, Esq., manufacturer and farmer, Dunkirk, France.
39. **Jacob Abraham Franklin**, Esq., Consulting Accountant and Auditor.

A Digest of Some of the Evidence

Salient points drawn from evidence presented by 39 world experts showing advantages of world-wide metric standardization (from Minutes of Evidence presented under examination by witnesses before the Select Committee on Weights and Measures of the British House of Commons, May, June, July, 1862):

1. **Metric Units are essential to the development of world trade:**

Leone Levi, F. S. A., L. L. D., jurist and statistician, author of great work on commercial law and "History of British Commerce," Professor of Commerce at King's College, British Isles:

"The greater the intercourse with foreign countries the more are we under the necessity of studying their institutions. We shall of necessity have more to do with the metric system in proportion as our foreign commerce increases. More orders for **machinery** will come, with regard to which great precision is necessary, and these orders will be sent to this country by foreigners in their own dimensions; and if we have not the means and do not acquire sufficient readiness to cope with such increased wants, we shall certainly be left behind." 13 May, 1862.

The following resolution was made in 1855 at the **Paris Exhibition:**

"The undersigned members of the International Jury of the Universal Exhibition in Paris, or commissioners sent by their respective governments to this Exhibition, declare it to be their deliberate opinion, that one of the methods best adapted to accelerate that happy movement which **brings all nations together** in the paths of their industry would be the adoption of a universal system of weights and measures."

The **Statistical Congress at Brussels** in 1853 urged world installation of meter-liter-gram:

"It was deemed advisable with a view to improve the statistical organization of the different countries, and with a view to derive mutual advantage from such statistics."

Frank Perko Fellows, merchant and capitalist, Wolverhampton, British Isles:

"We are especially a **manufacturing** nation. Isolation is therefore death to the British Isles. I think a complicated and varying system of weights and measures in any country is about one of the greatest bars that can exist to the spreading of trade: you **cannot communicate** commercially with other nations if you do not use their standards of weights and measures." 16 May, 1862.

"It is advisable for us to adopt that system which is adopted by the bulk of our customers, and by those customers who are increasing the quantity of goods they require from us." 16 May, 1862.

2. **Use of metric units is vastly superior to use of British jumbled weights and measures:**

Sir Charles William Siemens, C. E., F. R. S., D. C. L., L. L. D., master of metallurgy and electricity, invented electric furnace, bathometer and electric thermometer; took out 113 patents; President of British Society of Mechanical Engineers and President of British Iron and Steel Institute:

"I think a measure is required approaching the length of the yard. In every country there is a measure nearly approaching to the length of the arm. We should not find the want of a yard measure if the meter were used. I should adopt the whole metric system because in doing that a simple calculation will bring us thru all the different measurements that occur in practice." 30 May, 1862.

Sir William Fairbairn, F. R. S., L. L. D., I. M. E., M. I. C. E., master civil and mechanical engineer:

Question: "In the construction of machinery are not very nice subdivisions sometimes required?"

Answer: "Yes, particularly in tools and machines of precision. The decimal system then comes in much better than by taking the foot, the inch, and the ⅛th inch, and then the 16th and the 32d, and so on."

"Independently of any legislation on the subject the decimal system will ultimately get into all mechanical operations because it is much more convenient and gives greater facilities for calculation."

Leone Levi, F. S. A., L. L. D., jurist and statistician, author of great work on commercial law and "History of British Commerce"; Professor of Commerce at King's College, British Isles:

"There is no doubt that by facilitating the means of calculating you require fewer clerks; 2 or 3 are now required to make those long heavy calculations made in the Customs when one clerk would be sufficient if the calculations were made on the decimal system." 13 May, 1862.

"With the metric system **a mistake can hardly occur.**" 13 May, 1862.

"The commercial classes in this country have long felt the inconvenience of the present weights and measures and the differences in them, but they have not taken any steps singly on that subject." 13 May, 1862.

Frank Perko Fellows, merchant and capitalist, Wolverhampton, British Isles:

"From a commercial point of view, **the calculations of the French merchant are made in one-half the time, or less, than with us.** I consider that the metric system would not only save time but also there would be a great saving in the quality of labor. It has been stated that the London and northwestern R. R. Co. would save about £10,000 a year [$50,000]. I consider that in the government departments they would save from £250,000 [$1,250,000] to £500,000 [$2,500,000]. Of course that includes the arsenals and the calculations that are made with regard to building ships." 16 May, 1862.

"I have considered the question with regard to decimalization of British weights and measures and I have made a great number of calculations to see how we could decimalize them. The result is that our system could be patched-up; but it would be a patched-up affair. It would be best at once to introduce the metric system." 16 May, 1862.

Charles Hutton Gregory, Esq., C. E.:

"I find in the various and irregular divisions of money, weights and measures a continually recurring source of error, and these errors are very difficult of detection and take a long time to rectify. The extreme irregularity that exists in all our weights and measures, and the absence of symmetry is also the cause of a very great loss of time.

"From my own experience in the use of decimal weights, measures and coins, I fully believe that they are **very much less liable to error,** and that this is a marked advantage in the decimal system in addition to the saving of time." 3 June, 1862.

3. **World experience shows ease in advance to exclusive use of metric units:**

M. Michel Chevalier, French Senator, French Councillor of State, Member of the French Institute; Professor of Political Economy in the Collège de France:

"The government of Louis Philippe of 1830 in one day resolved to have the metric system adopted and succeeded easily in its adoption by the people at large. It was thot by some that it would cause great embarrassment to the people, especially to workmen and to manufacturers and that it would be impossible to carry out the reform. The fact is that it was accomplished with perfect ease, and those persons particularly who have adopted the system are those workmen and manufacturers who were said to have been against it." 23 May, 1862.

M. Auguste Visschers, member of Belgian Board of Mines, member of Belgian Central Statistical Commission:

Question: "Do you think the tradespeople of Belgium have suffered or have benefited by the introduction of the metric system?"

Answer: "I think they have gained considerable advantages from it." 24 June, 1862.

J. B. A. Lorsont, merchant having offices in Belgium, France and British Isles:

Question: "How do you consider the metric system has answered in Belgium and France?"

Answer: "Very well indeed; **no one would go back now to the old** weights and measures."

Question: "As a commercial man do you find that you are benefited by the metric system?"

Answer: "Yes. With British adoption of the metrical system I could spare 2 clerks in my London office and **prevent a great deal of error.**" 13 May, 1862.

In 1922, the Report of 1862 is even truer than it ever was before. The benefits to be derived from the adoption of the metric system in education, in science, in industry, in world war, in world trade, are greater now than they were then. All the civilized world (with the exception of the British Commonwealths and the United States of America) has since that time become standardized on metrics and speaks that **universal language of quantity.**

The British and the Americans must join with the rest of the civilized world in the movement toward world standardization thru the adoption of **Meter-Liter-Gram.**

CHAPTER 13

SELECT ARTICLES ON METRIC STANDARDIZATION

FOR 140 years there has been worldwide discussion of metric standardization. Books, articles and pamphlets by the thousand have been issued in behalf of world uniformity of weights and measures. Many of these are listed in the next chapter, "Look It Up," but in limited compass merely an indication can be given of the tremendous mass of printed material bearing upon this world-important subject.

It is not possible in this one volume to present the reader with all of the best writings on the Metric System. However, some of the most authoritative recent articles can be here reproduced; and it is hoped that their perusal will lead to further investigation of this timely topic, thru use of the book-list which follows. The articles in this chapter are:

1. **The Metric System of Weights and Measures.** By Arthur E. Kennelly.
2. **The Metric System as an Aid to After-War World Trade.** By William C. Redfield.
3. **World Trade, World Unity and Metric Standardization.** By W. H. Hammer.
4. **The Universal Language of Quantity—Meter-Liter-Gram.** By William E. Hague.
5. **Industrial Reconstruction and the Metric System.** By Harry Allcock, M. I. E. E.
6. **Metric Units and World Trade.** By Aubrey Drury.

The first article is by Arthur Edwin Kennelly, Professor of Electrical Engineering at Harvard University since 1902, and director of electrical research at the Massachusetts Institute of Technology. (See his biography in "Who's Who in America.") He was for many years principal electrical collaborator with Thomas A. Edison; the great inventor's views on metric standardization are also his. Arthur E. Kennelly has served as president of the American Institute of Electrical Engineers; and he is a leading member of the American Metric Association and the World Metric Standardization Council. He has been signally honored by his selection to serve as American Engineering Exchange Professor to France, 1922.

THE METRIC SYSTEM OF WEIGHTS AND MEASURES

By ARTHUR E. KENNELLY

A SIMPLE, practical and scientific system of units requires to be a decimal system, in order to make it possible to transfer from a larger to a smaller denomination, or vice versa, by a mere change of the decimal point. This generally acknowledged fact is instanced by our American currency—dollar, cent, mill. There is **one unit**, the dollar; because a sum of money expressed in dollars is instantly converted into cents, or mills, by a shift of the decimal point, without any appreciable mental effort. In the British Isles, however, the currency not being decimal, but divided into guineas, pounds, crowns, ½-crowns, florins, ½-florins, shillings, ½-shillings, pence and farthings, **there are 7 different units**. Pencil and paper will generally be required by any but skilled mental arithmeticians to transfer a sum of British money from one expression to another.

Merits of Decimal System

To an American the superiority of decimal currency over the non-decimal currency of his British cousin is so self-evident as to require no emphasis.

What applies to currency units applies also to units of length, area, volume and weight. A simple rational system of such measures must, as is generally admitted, be a decimal system. In this way large and small units may be related like the dollars, cents, mills of United States and Canadian currency. . . .

In British and American measures of length we have the following units, all taught in the schools and all used more or less—league, statute mile, furlong, engineer's chain, surveyor's chain, rod, pole, perch, yard, foot, engineer's link, span, surveyor's link, hand, inch, line. Those numerous units involve more than 100 cross-connecting ratios.

In the metric system there are the meter (about 10% longer than the yard) and its decimal derivatives, all evaluated at a glance by a shift of the decimal point.

The same comparison and contrast apply to volumes. We have the cubic inch, cubic foot, cubic yard and cubic rod. World metric measure has the cubic meter and decimal derivatives. That is to say, there is virtually but one unit.

For the dry measure of volume, we now have, to make our confusion complete, pints, quarts, pecks, bushels, barrels, quarters and chaldrons. Moreover, our bushels, although nominally the same, actually vary according to the commodity measured; there being, according to "The World Almanac," some 20 different sorts of bushels

by the laws of America, from a bushel of bran weighing 20 pounds avoirdupois to a bushel of fine salt weighing 167. Add to this joy the recollection that there is a difference of about 8% between the British and American dry bushels, pecks, quarts, etc., and we attain the unhappy result that none can say precisely what quantity is meant by the term "bushel," save by chance.

In regard to the unit of weight, the metric system has the gram. . . . The weight of any object is brought immediately before the mind in relation to that of any other object, large or small, since virtually one unit—the gram—is always used.

Obsolete Weights We Are Weighted With

In contrast with this simple expression of weights in the metric system, we have in this antique jumble 3 kinds of weights: namely, apothecary's weight, troy weight and avoirdupois. The 2 first mentioned have their ounces in common but differ otherwise. It is impossible, therefore, to determine, except by context, precisely what is meant by the word "pound" as a unit of weight in English-speaking countries. It may be the troy pound of 5,760 grains or the avoirdupois pound of 7,000 grains. [Then, of course, there is also the money "pound."]

The cross-ratios connecting these various units are several hundred in number and very complex. In avoirdupois weight there are 9 units; the cross-ratios are 45. Moreover, there are 2 tons in the United States of America, a ton of 2,240 pounds and a ton of 2,000. In general literature it is frequently impossible to determine which of these tons is referred to.

Confusion of British Liquid Measures

When liquid measure is considered, the medley and jumble of British measures is, if possible, worse. The gallon in common use in Britain is 20% larger than the gallon in use in the United States. The same ratio affects all the subdivisions—pints, quarts, and so on. It is often difficult to tell whether the British beer measures or American wine measures are referred to when the terms are encountered in literature. Occasionally an American book or catalog will quote British gallons, or vice versa, without any reference to the 20% discrepancy. Moreover, we have apothecary's fluid measure containing as units the minim, drachm, ounce and pint. These measures are again different in the British territories and in the United States of America.

If we should attempt to collate all the British and American units of volume, both "dry" and "fluid," and express each unit of the table in terms of all the others, the table would contain more than 1000 entries or cross-ratios. In the corresponding table of the

metric system there would be virtually only one unit, and all others would be expressed therein by a shift of the decimal point.

If an attempt were made deliberately to construct a medley of weights and measures as a burlesque, for sensible, practical people to make sport of, it may be questioned whether such a farcical, hypothetical medley would be more illogical, incoherent or cumbersome than that we now use.[1]

So complex are our customary weights and measures, that there are few persons who can recite from memory all the various tables taught in American schools. Many cultured persons are not aware of the difference between British and American gallons, quarts, pints, bushels, pecks, and so on.

No Difficulty in Learning Metrics

We have the history of almost all the continental nations of Europe, and of America south of U. S. A., to guide us in estimating the small degree of difficulty to be expected in effecting the advance to metric units. France was the first country officially to adopt the metric system. Spain officially adopted the system in 1849, Italy 1850, Portugal, 1852, Switzerland 1877. Germany and Austria-Hungary officially adopted the system in 1871. Russia, unofficially, in 1900.

Beyond the advantages inherent to the system and its world-wide use, there does not seem to have been any pressure which would have brought the change. Few persons now living in Spain or Italy would be able to remember the conditions at the time of inaugurating the metric system. In Germany, however, the official change was made in 1871 and the events connected with it are remembered by a large number of people. The testimony seems to be that the transition was made in the cities during the course of a few weeks, in the country in a few months, so that **in a year** the metric system was practically in general use. The manufacturers *continued to use their tools, standards and machines just as in the past;* and as time went on, and machines became renewed, they were changed to even metric sizes.

So far as can be ascertained from the history of transition to the metric system abroad, the transition in the British Commonwealths and in the United States of America *should not require any machine, implement, tool or piece of apparatus to be discarded or abandoned.* The adjustment would *not* be expensive in new machinery. *Any trouble would be intellectual rather than material.* New price-lists would have to be prepared in terms of meter-liter-gram. In stores where sales had previously been made by the yard, they would be made *by the meter,* which is a measure about 10% longer. In stores

[1] And, Kennelly might have added, which we got from Germany and which the Germans scrapt, 1871.

where sales had been made by the pound avoirdupois, sales would be by the 500 grams, which is about 10% more than one pound. This would involve adjustments of foot-rules, yard-measures and sets of scale-weights, together with revision of price-lists. If the transition occurred suddenly, there would be confusion; but if it took place gradually, it would not be serious.

It is the experience of the average American in a country where the metric units and coinage have both to be acquired, that complete familiarity is attained in less than 2 weeks.

English-Speaking Peoples Have Lagged Behind

If it be questioned as to whether it is worth while for the nation to make this advance, it should be remembered that practically all countries, except English-speaking countries, have already considered it well worth while, *and have done it,* and that none of these countries has expressed regret for, or any desire to retrace, the step. Moreover, the work involved, if the transition is not too sudden, will be small compared with the labor saved and the gains made.

It is the often-repeated statement of the United States consuls working abroad that the non-metric price-lists, weights and measures of American manufacturers, merchants, producers, are a heavy handicap on American world trade. Already the metric system is used in the United States of America for nearly all scientific work. It has permeated popular literature. It has possessed itself of pharmacy and microscopy. The world electric units are metric units. We have the metric principle in United States and Canadian currency. A 5 cent piece weighs, by law, 5 grams, and a silver dollar 25 grams. The 50 cent silver weighs 12½ grams; the 25 cent and 10 cent piece, respectively, ½ and 1/5 the weight of the 50 cent piece. The U. S. American foot is defined by law as a certain fraction of the world standard meter.

The Prime Ministers of Canada, Australia, New Zealand and Union of South Africa officially urged strongly upon the Secretary of State of the British Isles, the importance of adopting metric units thru all British lands. At the Congress of the Chambers of Commerce of the British Empire, held in Montreal, with delegates from all parts of the British world, a strong resolution was passed concurring in this action of the Prime Ministers, and pressing the British Isles government to adopt the metric units forthwith. . . .

It is inevitable. The elimination of the useless, and the survival of the fittest, will bring about the worldwide adoption of the metric system—METER-LITER-GRAM.

* * * *

Chapter 14, "
ing those with
British Parliam
on metric stand
Reference sh
mal Educator,"
Decimal Associa
current evidence
measures on the
In view of al
metric units thr
The basis fo
logic of such ar
mentary Report

THE M

A SIMP
a dec
a larger to
of the dec
by our Ame
dollar, becau
verted into
appreciable
not being
crowns, flor
there are 7
quired by a
British mone

Illustrations of
Decimal System

What ap
area, volume
mount, as is
large and s
of United St
In British
ing units, all
statute mile,
perch, yard,
line. Those
ration
In the m
the yard) an
shift of the d
The same
the cubic inc
measure has
say there is
For the d
fusion comple
shoulders
actually vary
cording to

ds in Dublin or Cork? Or
erchant to Turkey to offer
Cross? . . .

staking way. Observe that
he goods to the desires of

nce as a manufacturer of
re forced to recognize that
same principle we might
oad, and if we did not sell
g. Consequently we looked
nd that the machinery and
nd France sent to South
We found it absolutely
wn against our competitors,
actured our wrenches with
d not involve any trouble.
milling cutter the requisite
ould produce wrenches on
stem. It was before 1900
I spent 10 months selling
and Denmark; and I found
the way the people wanted
o stay out of the business

an sell and is selling quan-
f the metric system. Cer-
ertain extent, but compared
adapt herself to the needs
nants. The day when any
uld impose its ideas on any
oods has gone by, and the
tures now is to sell people
what they want from your

the United States standard
metric system, and it would
ne constructed on the feet-
s has been my own experi-
les with the experiences of

The following article is an abridgement of an address delivered by Hon. William C. Redfield, when United States Secretary of Commerce, before the American Association for the Advancement of Science, Metric Section, at Baltimore, 27 December, 1918. This is a powerful demand for metric units from the ideal mobile merchant-manufacturer of America, whose business it has been to find out, and secure, those things which are most needed by American business, industry, commerce and trade. He is himself a practical, successful manufacturer and work-finding merchandiser; 2 times President of the American Manufacturers Export Association, and President of the National American Society for Promotion of Industrial Education. He is a man who, to find more employment for American workers, has traded, traveled, and searched for work all over the world. He speaks with the world-trade viewpoint.

THE METRIC SYSTEM AS AN AID TO AFTER-WAR WORLD TRADE

By WILLIAM C. REDFIELD

FROM the point of view of world trade, the adoption of the metric system is merely one way of giving our customers what they want. It seems as if this should be a maxim in domestic and world trade. First, find out what your customer wants; then find out how to make it, if you have to; and then put it on the market. But simple as this procedure sounds, it requires a foundation of scientific method that has, unfortunately, been lacking, generally speaking, in American industry. Germany's industrial strength was due to painstaking research and the application of scientific knowledge. The utilization in world trade of this German habit of research may be illustrated as follows:

There are native tribes in Central America to whom it was found difficult—almost impossible—to sell textiles. The Germans asked an ethnologist, "What designs in textiles do these people consider sacred and propitious? What colors do they think lucky and what colors unlucky?" With the accurate knowledge thus obtained of the tastes of this Indian tribe, the German designer and dyer prepared their goods, and when their salesmen went to Central America they offered the Indians textiles whose designs and colors appealed to their religious and tribal superstitions. This seems simple and natural now, but a few years ago it would have seemed amusing in the extreme to consult an ethnologist about the designs to be produced in a textile factory.

Would you offer orange-colored goods in Dublin or Cork? Or would you attempt to send a mobile merchant to Turkey to offer textiles with designs including the Holy Cross? . . .

Germany built up her trade in a painstaking way. Observe that the fundamental feature was adapting the goods to the desires of the local community.

How to Hold World Trade

In my own experience as a manufacturer of engineers' tools, we were forced to recognize that unless we followed this same principle we might just as well not attempt to sell goods abroad, and if we did not sell any goods abroad our factories were too big. Consequently we looked to see what the world wanted, and we found that the machinery and tools that Germany, Switzerland, Italy and France sent to South America were built on the metric units. We found it absolutely necessary, if we were going to hold our own against our competitors, to follow their example. We then manufactured our wrenches with openings cut to the metric units. It did not involve any trouble. It meant opening the jaws of a double milling cutter the requisite amount of space, and the same machine would produce wrenches on the metric system and on the British system. It was before 1900 that the change was made. In that year I spent 10 months selling these goods in France, Belgium, Germany and Denmark; and I found that if the goods had not been made in the way the people wanted them to be made we should have had to stay out of the business altogether.

I have heard men say that America can sell and is selling quantities of goods abroad without the use of the metric system. Certainly that is true. She can do that to a certain extent, but compared with what America can do if she will adapt herself to the needs of the people abroad, **it is like selling remnants.** The day when any nation engaged in industrial production could impose its ideas on any other nation to which it desired to sell goods has gone by, and the only way in which you can sell manufactures now is to sell people exactly what they want—or they will get what they want from your competitor.

No amount of explanation will make the United States standard wrench fit a hardened nut finished on the metric system, and it would be equally hopeless to try to sell an engine constructed on the feet-and-inches basis for use in France. This has been my own experience, and I have no doubt that it coincides with the experiences of many other manufacturers.

Metric System Simple and Effective

I firmly believe, and have long believed, that the metric system offers a return to simplicity, offers effectiveness of thought, offers much even to the children in our schools that we are not justified in withholding from them. It is obnoxious to me to use an ounce of 480 grains when I deal in platinum and an ounce of 437½ grains when I deal in iron and steel. There is no reason that an absurdity should go on because it has gone thus far.

Old Units Numerous and Confusing

We have in use in the United States of America 130 kinds of bushels. I do not see, either, why we should have to worry with so many different kinds of tons. In the Bureau of Navigation of our Department of Commerce, we wrestle with net tons and gross tons and dead-weight tons and displacement tons, no one of which is quite like any other. There are also certain tonnage measurements in use in the British Isles that we sometimes try to apply in America. And then, also, there is the *tun*. Why should we be content longer with this confusion that makes interminable, unnecessary trouble?

Need Metrics to Keep Trade

From a practical standpoint, the nations of the world to which Germany supplied goods are now looking to America and Britain for supplies. Shall they get what they want? If you were a hardware merchant in Buenos Aires, Santiago, Rio or Lima, you would have been buying machinery, implements, tools, and hardware in Germany probably for many years. This material would have been served to you conforming to your national metric standards of measure in Chili or Argentina or Brazil. Where will you get it made to those standards now? In the United States of America? Not unless American manufacturers are wise enough to do what the Germans did so successfully. If the Chilean merchant, the Argentine merchant, the Peruvian merchant, or the Brazilian merchant comes to the United States of America seeking commodities in millimeters and finds them in inches and ½-inches or in that absurd measure that I recall, termed ½ of 1/64th of an inch, he will look for men more flexible in mind and more intelligent in their business practice.

If we want to throw the business of the United States of America into the hands of a Germany of the future or into the hands of the French steel manufacturers, or if we wish to develop the business of Italy, the Netherlands, Denmark and Spain, we can accomplish this end by confining ourselves to the foot-and-inch units, which do not work well in other countries and which the world will not have.

When our mobile merchants go to South America they must serve goods that the customers want, or the customers will get the goods elsewhere. I strongly suspect that the bankers in South America will support the commercial houses that do business in that way. I am certain that if I were a banker and were asked to promote an enterprise abroad that insisted on imposing local standards on a foreign people, they should not have credit from me to back them up. But if I found an American concern that was disposed to adapt itself to the wishes of other people and work with them in their own way, they should have all the support and all the credit that I could reasonably offer.

New World Demands New Thoughts

I think you will find that the view I have expressed is daily more representative of those who control the resources and the credit of the United States of America. I would not cause needless expense to any American concern nor advocate that even necessary changes be made too suddenly, but I would point out to them that we can not think now the thoughts of 1914 (to our safety and advantage), because we are living in a **changed world.** One of the problems involved in our adjustment to the new world is this matter of simplified weights and measures, and we may as well prepare at once gradually to make the changes necessary.

* * * *

The next reprint is an address presented by W. H. Hammer of the firm of Hammer & Co., President of the World Trade Club (1917-20), to the Annual Meeting of the Association for the Advancement of Science, St. Louis, Missouri, 29 December, 1919. Mr. Hammer's company was established in 1862, and he and his firm are known thruout the world. His business relations have been particularly with the Orient and Latin America. When the great National Foreign Trade Convention met in San Francisco in May, 1920, W. H. Hammer was Chairman of the Reception Committee, and delegates from all over the United States and from a score of over-seas countries can testify to his gracious efficiency in California hospitality. On 15 May, 1920, following the National Foreign Trade Convention, Mr. Hammer was named President of the World Metric Standardization Council, at the conference held by that organization in the Palace Hotel, San Francisco. He is recognized as an authority on metric standardization, especially in relation to international commerce.

The following message carries convincing proof of the urgent need for world metric units of weights and measures for merchandising thruout the world.

WORLD TRADE, WORLD UNITY AND METRIC STANDARDIZATION

By W. H. HAMMER

WORLD trade and metric standardization bear a close and important relation. All civilized nations except the United States of America and Britannia have adopted the metric standards in world trade. In 40 countries meter-liter-gram are the only legal weights and measures; in 212 countries they are recognized by law and used more than any other units. From Argentina to Zambesia, in West Africa, in Dutch East Indies, in Tibet, and on the borders of the Sahara, they use metric units. Notwithstanding the fact that the United States of America has not kept pace with new trade demands, it must be borne in mind, nevertheless, that even here meter-liter-gram are used extensively in many important and practical fields: in science, in medicine, in coinage, in government work, in education, and in industry. Hundreds of manufacturing concerns now employ metrics. They realize that there "is a very close relation between the making of goods and the merchandising of goods." Packers and canners exporting to South America, manufacturers of machinery, of tools, of locomotives for foreign use, of kodaks, and makers of a vast number of other materials are today of necessity using meter-liter-gram. World trade and metrics bear a very close relation.

Basis of Export Trade

In general, export trade depends upon self-evident factors: (1) obtaining entrance for goods, (2) giving complete satisfaction so that repeat orders follow. Here we come to the important relation which metric standardization bears to world trade. We are seeking to extend our commerce to those countries which German influence has hitherto dominated. We must recognize that the changed world trade demands a change. "Folly is that wisdom which is wise only behindhand." We are "entering on this fierce competition equipt with the wrong kind of tools." Now is the appointed time for the essential change. We must profit by the experience of Germany if we are to get and hold her former trade. We should adapt our goods to the desire of world consumers. Purchasers should be able to understand our weights and measures. We are losing valuable world trade today. We are violating fundamental rules that govern the art of merchandising.

Let me instance from United States Consular Reports. One of the most recent statements issued by the United States Treasury

Department says: "Those who read the Commerce Reports of the United States Department of Commerce know how numerous are the opportunities necessarily allowed to pass by because of our inability to supply goods and machinery constructed in accordance with the metric system." Here are some typical reports from Europe: In 1918, Consul Lewis W. Haskell of Geneva, Switzerland, wrote: "It has been ascertained that a Swiss purchaser of iron sheets of 3, 5 and 7 millimeters in thickness, was informed by a British manufacturer that it would be impossible to furnish sheets of the thickness given in millimeters, as these sheets were made according to the fractions of an inch. American manufacturers . . . . will do well to take note of this item." The American Consul at Havre, France, writes: "The sooner American exporters learn the metric system of measurements the better chance they will have of successfully meeting foreign competition in the French markets. For example, Austrian oak in France commands a higher price than American oak and is used in preference, altho in many cases the former is not as good as the American wood. The reason is that the Austrian shippers are careful in having their wood sawed to the metric dimensions called for by the French consumers, while the American shippers send their wood sawed to inches." The British consul in Amsterdam previous to the great war wrote: "I may instance as an undoubted fact that the preference which Germany has obtained here over Britain as regards railroad bridges and other railroad material is mainly owing to the existence of this metric classification." The consul at Nice, France, wrote of the metric system: "If any recommendation of mine should quicken its introduction into the United States, I should feel amply repaid for my labor in this behalf."

Need of Metrics in Latin-American Commerce

Here are some typical reports from Latin America: The Consul at Mazatlan, Mexico, writes: "United States manufacturers and exporters could greatly increase their trade if they would employ the metric system of weights and measures." An agent of the Department of Commerce writes from Cuba: "An American merchant would not send to his customers in the United States a catalog or circulars printed in Spanish with commodities measured in grams, liters or meters, yet tons of matter printed in English and giving prices of pounds, gallons or yards have been sent to Cuba." A report comes from the Consul-General at Rio de Janeiro: "Brazilians are unfavorably impressed when they receive commercial correspondence in which references are made to feet, yards and miles instead of meters, to which they are accustomed." As a

result, we read the lines of a special agent from Brazil: "European styles are followed and European goods are much better known because the sizes, weights and the prices are in the metric system." Finally, the Consul at Puerto Cabella, Venezuela, writes: "It is generally agreed here that the compulsory adoption of the metric system was a wise measure and that its use has simplified and facilitated the transaction of business." Of the many reports calling for metric standardization these are sufficient to show that we must scrap our antiquated system of weights and measures to meet new world trade demands. We are lagging behind in the competition for world markets. Should we be hindered by a complicated system of weights and measures? We must adopt meter-liter-gram to extend our trade to those countries which German influence has hitherto dominated. We should recognize the important relation which metric standardization bears to obtaining entrance for our goods so that they shall hold firmly on to world trade.

Competition Hastens Metric Standardization

In most respects the same requirements stand for obtaining trade as for holding trade. Metric standardization will help give entrance for our goods. It will help also to give complete satisfaction so that repeat orders will continuously follow. A former United States Government Secretary of Commerce, William C. Redfield, brings a broad experience as a manufacturer as well as a deep interest to the consideration of this question. He says: "We found it absolutely necessary if we were to hold our own against competitors to manufacture to the metric units. We found that if the goods had not been made in the way the people (of the world) wanted them to be made we should have had to stay out of the business altogether."

Confusion Results from Present Jumble

Another consideration affecting weights and measures makes it difficult for the United States to hold world trade. "Confusion worse confounded" is the inevitable result of the present jumble. The metric system would cut asunder these "ancient intolerable bonds." Carlyle truly said "it is singular how long the rotten will hold together, provided you do not handle it roughly."

The American Consul at Amsterdam reports: "The necessity for United States manufacturers to adopt the metric system in world trade becomes daily more imperative. A firm in Holland received this week a cable offer from New York for 2,000 barrels of potatoes. As this was new business, the question at once arose how many pounds were there in a barrel of potatoes. A whole day was lost before the answer could be wired. Had the offer

been made in grams, every business man in the commercial world from Vladivostok to Mauritius would have understood it instantly." A Canadian Consul states: "As the American hundredweight is 12 pounds less than the English, and as tins, sacks and so on, supposed to be the same size, differ in weight, proper adjustment of the difference seems only fair to both seller and purchaser. Often purchasers buy an underweight package thinking they are getting full weight."

The question of the 100 weight as suggested by this consul brings up other important and timely considerations. The present weight and measure confusion and waste can be forcibly demonstrated by examining a report of the American Consul at Liverpool, England. He shows the immense saving brought about by one comparatively unimportant change in the direction of metric standardization. "The most important events are often produced by trifles." The British government sanctioned the use of a weight of 50 pounds instead of the "half 100 weight" of 56 pounds. This one move for the decimalization of British weights had important and far-reaching results. "More cotton, corn, provisions and tobacco are imported into Liverpool than into any other city in the world." The Liverpool "Journal of Commerce" comments as follows: "All these great quantities are calculated by the American sellers in pounds avoirdupois, but by the British buyers they have had to be counted in 100 weights, quarters and pounds in accordance with our antiquated and absurd and anomalous system of weights. What is the consequence? To give a sample: The buyer wishes to ascertain, say, the weight of 100 pounds of tobacco; to do so the nearest weight he can employ is a quarter, 28 or 56 pounds, to which must be added smaller weights until the exact quantity is ascertained—[but] it should be remembered that the men who weigh these materials at the docks are unskilled laborers—to weigh quantities with a set of weights necessitating the calculation of fractions of pounds, and thereby the use of dozens of small weights, necessitates a mental effort of which all are not capable; the use of a multiplicity of weights which confuses them leads to errors and loss of time—and time is money. By the adoption of a 50-pound weight a unit of calculation has been obtained which will sweep away a whole set of weights, prevent errors and save confusion, time and money." The article goes on to point out that these wasteful methods have to be gone thru 4 times and concludes by saying: "The saving in bookkeeping will alone be great. The present system necessitates a maze of figures of different denominations; but by their reduction to the one common denominator of pounds

weight, whole columns of figures will be saved and risk of mistakes minimized." The eloquent results of this one comparatively insignificant change are irrefutable.

Simplicity Results from Meter-Liter-Gram

Think of the immensely greater benefit obtainable thru adopting a system of weights and measures which not only has the advantages of decimal computation but has only 3 simple principal units—meter, liter, gram, all logically inter-related. The conclusion is evident. **The evidence is ample.** By metric standardization we would sacrifice nothing but a complicated jumble of weights and measures. "New occasions teach new duties." We must profit by the experience of Germany if we are to get and hold her former trade. "A want of perception is the devil's deadliest ally." We must junk our antiquated weights and measures if we are to get permanent markets for our goods and if we are to give complete satisfaction so that repeat orders follow continuously.

The old Greek philosopher, Pythagoras, in his idea of numbers gave 10 the character of governing the world. Did he foresee a universal decimal system of coinage, weights and measures? If so, such a rule would allow a fitting entrance into the future's portal. The old proverb "Weight and measure take away strife" would be really fulfilled and the prophecy would be consummated that

> "One weight, one measure, and one coin
> Will soon the warring world in friendship join."

* * * *

Following is an address prepared by William E. Hague, when Secretary-Treasurer of the World Trade Club of San Francisco, for presentation at the Annual Meeting of the American Association for the Advancement of Science, St. Louis, United States of America, 29 December, 1919, upon invitation from the Association. Mr. Hague is a practical world merchandiser, having traveled extensively thruout China and the Orient, in Europe and other parts of the world. His widely-circulated letters on metric units are well known. As he so justly says in one of these, "The demand for metric standardization is insistent. As the advance will benefit all humankind, it deserves consideration and whole-hearted support."

THE UNIVERSAL LANGUAGE OF QUANTITY

Meter-Liter-Gram

By WILLIAM E. HAGUE

SCIENCE advances with international intercourse. What furthers international intercourse, such as improvements in transportation and in communication, advances science in every branch. What hinders human intercourse just as surely clamps a brake upon the forward movement of scientific achievement.

There is not one among us who does not admit that his own scientific researches would be potentially greater if he understood all languages; or, what would be equally to the point, if the human family spoke and wrote but one language only.

In some branches of human intercourse the barrier of diverse languages has been broken down. The medical profession or the science of botany, to take 2 examples, utilize established Latin phrases, internationally understood, to bring about exact exchange of facts. All the civilized world uses the so-called Arabic numerals, perfectly recognizable at sight in every nation, however variously they may be pronounced by the tongue. For proof of this, see the figures 1 2 3 4 5 6 7 8 9 0 on all typewriters, in all languages.

We cannot, however, alter our mother tongue into an alien language offhand, even if we want to. But there is one broad field of human intercourse in which we can make our medium of communication blend perfectly with that of all advanced nations. I speak of our units of weight and measure.

Meter-Liter-Gram like Dollar

Gentlemen, the meter-liter-gram, or 3 principal metric units, are as simple as the division of a dollar into cents—mills. No one in this room would wish to go backward to the pounds, shillings and pence; the guineas, crowns and farthings of "the old country" of the United States of America. Once established, the decimal system in measuring money has become as matter-of-factly popular, as it is sensible and simple.

But we are still annoyed with the inch, a twelfth of a foot; the foot, a third of a yard; the foot, a sixteen-and-two-fifths of a rod; the foot, a five-thousand-two-hundred-and-eightieth part of a mile; or the pint, a half of a quart; the quart, a quarter of a gallon; the gallon an unknown part of a barrel—my memory of matters learned in school days does not serve me farther. We are still pursued by those archaic measures, the gill, the peck

and the bushel—even admitting that the whole world is fed just now by these old bushels. We still have the ounce, which is a sixteenth part of a pound except when it is a twelfth part of a pound; and the pound, which is a two-thousandth part of a ton except when it is a two-thousand-two-hundred-and-fiftieth part of a ton. We still have units of measure which are as difficult to manipulate as the surveyor's link or chain, or the mariner's fathom or knot. We cannot conveniently wield them ourselves. And nearly all the rest of the world is serenely multiplying its centimeters by 100 and getting meters, just as we multiply cents by 100 and get dollars; multiplying grams by 1000 and getting kilograms, or dividing meters by 1000 and getting millimeters; and looking at us as wonderingly as we do at our sorely-tried British cousin who is trying to determine how much 10 articles will cost him when each one is priced at 2 pounds 4 shillings 3 pence and 3 farthings.

Scrap the Obsolete

Why have we not the foresight enough, the nerve enough, the initiative enough to scrap this pint-quart-gallon, this ounce-pound-ton, this inch-foot-mile system of ours for the easy decimal units of 212 other countries, before another generation of our children are again sent to the treadmill of determining in complicated arithmetic what their European cousins, except those of Britannia, can accomplish with a decimal point.

Metrics and World Trade

That opens up a whole new subject—world trade. Might as well expect a merchant in Kokomo, Indiana, to buy furnishing goods from a London firm that billed him in farthings, shillings, pounds and pence, as expect foreign nations on a metric basis to tolerate our complicated, archaic, silly, time-wasting and patience-exhausting inches, feet and yards; or our gills, pints, pecks, quarts and gallons. But tonight we are discussing the advancement not alone of world trade, but of science also.

As surely as we lag behind the other forward-moving nations in our units of weight and measure, so surely shall we lag behind in our potential scientific achievement. We cannot use their microscopes or their instruments of precision; or if we learn to use them, we cannot mend or duplicate them; unless we adopt their metric system. And if we do that our country is possessed by a dual standard—as much of an unmitigated nuisance as a dual telephone system in a community where one half possesses one and the other half does business over the other.

Why must we have both? For a moment's reflection will convince you that in America we already have both. Our sons, who fought in France, marched by meters, not by rods or miles. They discuss aeronautics in meters, not in inches. They trained guns on the enemy by millimeters, not by inches. They won the war with hair-splitting millimeters and mud-deep meters! Science and all the exact industries have gone over to metric units. Well, then! Since we cannot have the old exclusively, even if we want it, and since we cannot force it upon 212 other countries, because they have already scrapt it—what shall we do? Grope in the further complications of a double system? Or abandon the outworn and firmly grasp the world's best?

Metric Standardization for Industry

Industry can make the transition. It can be done gradually. It is being done gradually, but it should be accelerated by the adoption of a definite, forward-looking piece of legislation. Let us prepare for it and let us prepare the minds of our legislators. Let us take one of the brakes off world intercourse. Let us make the world a simpler, better place to live in. And let us soon see these inches and feet and miles, these pints and quarts and gallons, these long tons and short tons and troy ounces and avoirdupois ounces as obsolete as the ells and cubits of Biblical times—as the pounds, shillings and pence of our colonial ancestors.

* * * *

The article which follows takes up the need for the metric units mainly from a British point of view. It is written by Harry Allcock, mechanical and electrical engineer, who is a Director of the Decimal Association, Finsbury Pavement House 230 and 231, London, British Isles; also Honorary Secretary-Treasurer of the Manchester and District Decimal Association, of which the Lord Mayor of Manchester has served as President. Mr. Allcock is also a successful manufacturer in the Electrical Industry. He is one of the 2 executive representatives in the British Isles for the World Metric Standardization Council.

The reprint here given is an abridgement of a most valuable article published by the Decimal Association in April, 1919, having also appeared in "The Electrical Review," London, and "The Bulletin of the Federation of British Industries."

Harry Allcock prefaces his remarks with this statement: "The necessary expansion of British export trade, coupled with the imminent establishment of new industries and of new standards in old industries, calls for a reconsideration of the claims of the world metric system as the universal language of quantity."

INDUSTRIAL RECONSTRUCTION AND THE METRIC SYSTEM

By HARRY ALLCOCK, M. I. E. E.

ECONOMIC considerations now render the expansion of our export trade just as necessary in the national interest as was the production of munitions during the war.

Great Britain is no longer the sole workshop of the world, and as most of the other producing nations are faced with the same economic problem, it follows that international competition will be exceptionally keen. We have not only to secure our re-entry into those overseas markets which have been temporarily lost during our concentration on war work, but also to create new markets for British goods throughout the world. No effort must be spared, and all hampering influences must be eliminated.

Hitherto the general charge has been frequently made that we have not sufficiently considered the convenience of our overseas customers and that, in particular, we have hampered our own prospects by failing to submit our offers in the language of the country concerned.

There are 2 Languages of Quantity

In this connection, we are apt to forget that, although there are scores of spoken languages, there are now substantially only 2 languages of quantity, viz., the British Imperial system and the International metric system of weights and measures.

If either of these systems were adopted by the whole world as the sole language of quantity, the conduct of international trade would obviously be greatly simplified, and it is clear that Great Britain more than any other country would benefit from such uniformity due to her special dependence upon her world-wide export trade.

Looked at from this point of view, it would appear that sooner or later Great Britain must abandon the British Imperial system, because even its stoutest supporters would refuse to undertake the impossible task of inducing the world to adopt it.

On the other hand, apart from its inherent excellence as a system, the points in favor of our adoption of the International metric system may be briefly summarized as follows:

1. **Education.**—The committee recently appointed by the Prime Minister to inquire into the position of Natural Science in the educational system of Great Britain (Cd. 9,011) reported: "That

the present chaos of English weights and measures causes waste of time and confusion of thought, and that these are strong educational reasons for the adoption of the metric system."

2. **Science and Industry.**—The Scientists of the whole world (including those now working in the so-called "non-metric" countries) have already adopted the metric system. The experiences of war have proved the advantages of close co-operation between the scientist and the industrialist, and to that end it is desirable they should both work in the same system.

3. **Technical Progress.**—The ordinary rate of evolution in many industries has been accelerated by the experience of war to such an extent that "the best practice" of pre-war days is already obsolete. Extensive "scrapping" of patterns, etc., is inevitable, and a unique opportunity of starting afresh on the metric basis is thus provided.

4. **Commercial Progress.**—Just as in labor matters both employers and employed now fully realize the impossibility of returning to pre-war conditions and practices, so also on the commercial side are British manufacturers now disposed to develop new industries and to set up new standards in old industries, instead of merely reverting to the output of their unaltered pre-war products. By basing all new developments on the metric system, manufacturers would help themselves as well as the nation.

5. **Overseas Consumers.**—Our overseas customers may be considered under 3 heads, viz., (a) Our Colonies, (b) Our Allies, (c) General.

(a) **Colonies.**—This trade is reasonably preserved for us (no matter what system of weights and measures we employ) both by ties of national sentiment and by the Government's declared policy of Colonial Preference. It may also be observed that the Colonies have frequently expressed their desire to adopt the metric system whenever the United Kingdom does so. In the Dominions Royal Commission Report of 1917, the following statement with reference to the metric system was published: "There is clearly in the Dominions a considerable body of opinion in favor of the change. So far, however, all efforts to induce the **community of the Mother Country** to agree to the change have proved unavailing." . . .

(b) **Allies.**—All our European Allies have already adopted the metric system, and by now following their lead in this matter we should not only encourage them to entrust to British firms the temporary work of restoring and re-equipping their war-damaged factories, but we should thereby foster a spirit of perma-

nent alliance by promoting the development of inter-allied trade to its fullest extent.

(c) **General.**—If we regard the peoples of the entire world as potential consumers of British goods we must necessarily adopt the International metric system, because its use is now obligatory in some 34 countries (representing approximately half the population of the world), and legally permissive in practically all other countries.

In addition, it is recently reported that Russia . . . has decided to render the employment of the metric system compulsory throughout that country after a short transition period.

Even if they strenuously object to the metric system, British manufacturers and merchants thus cannot avoid its use, and the only escape from their present obligation to employ 2 systems—involving increasingly frequent conversions from one to the other—is for them to abandon the British system.

In the face of these arguments, it may well be asked, "Why does Great Britain continue to postpone her inevitable adoption of the metric system?"

Government Action Needed

Assuming that in the national interests, the exportation of manufactured goods must be increased, it is obviously the duty of the Government to facilitate International communications.

From the above notes it is clear that our use of the International metric system would be a useful step in that direction.

The Act of 1897 legalized the metric system in this country, but experience has shown that further Government action is required to bring it into general use.

It is accordingly suggested that the Government should forthwith announce that, having regard to its desire to simplify education, to assist in the re-establishment of British industries on a scientific basis, and to promote the development of British export trade, it has decided:

1. To encourage the more widespread use of the International metric system both in the United Kingdom and in the British Empire generally by officially recommending all British manufacturers hereafter engaging in new industries or introducing new standards into existing industries, to base their operations on the metric system on the distinct understanding that the Government will adopt that system as the sole legal system of weights and measures as and from ..... (a date, say, 5 years hence) . . . or upon such later date as Parliament may then decide.

2. To specify hereafter the requirements of all Government Departments in terms of the metric system wherever possible, and to recommend other public and semi-public buyers (e. g., Home and Colonial Governments, municipalities, railways, harbours, etc.) to follow their lead in the national interest.

3. To require the railways and other transport companies to accept consignments of goods described in terms of the metric system without demanding a statement of British equivalents.

4. To prepare the way for the complete change-over from the British Imperial System to the International metric system:

(a) By forthwith extending the practice already adopted of establishing metric standards by order in Council, e. g., on 14 October, 1913, the metric carat of 200 milligrams was ordained the legal standard of weight for precious stones and pearls.

(b) By forthwith abolishing all apothecaries' weights in favour of metric weights throughout the entire trade in fine chemicals and drugs.

(c) By forthwith abolishing many of the multiples of existing British units, and by requiring all quantities to be expressed in terms of single units instead of in a complex of units, e. g., to express weight in pounds, instead of in tons, cwts., qrs., lbs.

5. To prohibit the modification of existing British units or the introduction of any new units other than metric units.

6. To publish all official British trade statistics in terms of the metric system, retaining for a few years their British equivalents where necessary.

7. To require all scholars in public elementary schools to be efficiently taught the International metric system.

8. To require all applicants for appointments in the Civil Service and other Government Departments to have a working knowledge of the International metric system.

9. To advise the Overseas Governments of the British Empire and of the United States of America that the British Government has decided to adopt the International metric system as its sole legal system of weights and measures, and to invite them to take similar action, so as to secure its establishment as the universal language of quantity at the earliest possible date.

10. To act promptly along the above lines, so that British manufacturers and merchants may frame their peace programs with full knowledge of the Government's intentions, and by their esteemed voluntary use of the metric system anticipate its compulsory employment by the entire community.

Export Trade of the United States of America

As to the United States of America: The passing of the Webb-Pomerene Act (legalizing trade combinations for export purposes), and other indications, show that America now aspires to be an exporting nation in the widest sense, and it is accordingly not surprising to find that the Americans are now regarding the metric system with increasing favor. An extract from **Board of Trade Journal,** 19 December, 1918, says:

"More extensive use of the metric system in the trade and commerce of the United States is recommended in a resolution adopted by the United States section of the International High Commission, of which Secretary McAdoo is chairman, according to a statement by the United States Treasury Department. The statement follows:

"'The commission has regarded this subject as of particular importance in the United States. It is, of course, unnecessary for the United States section to recommend to the Latin-American sections of the Commission anything in connection with the metric system, which is exclusively in use throughout Latin-America.'

"'One of the main obstacles to documentary uniformity as between the United States and Latin-America is to be found in the fact that the United States does not make the use of the metric system obligatory and consequently its consular documents have to allow the use of that system merely as optional. Any uniform system of classifying merchandise, however, will require on the part of the United States thoro-going and complete adherence to the metric system.'

"Of more importance than statistical and administrative questions is the use of the metric system in trade. Now that the United States is being drawn in closer and more vital commercial relations with the rest of the world, and particularly with Latin-America, her manufacturers and exporters will be obliged, the report states, to meet the demands of their prospective customers in a somewhat more accommodating frame of mind than heretofore. Only the English-speaking nations still have to adopt the metric system of weights and measures, and among them the British Empire, or at least Great Britain, seems to be giving serious consideration to the necessity of making a change."

There can be little doubt but that, whether the United Kingdom or the United States first adopts the metric system, the other would rapidly follow and, having regard to our relatively greater dependence upon our export trade, it is obviously incumbent upon Great Britain to make the first move, although it would not be surprising to find the less conservative Americans taking the lead.

* * * *

In the present volume, description has already been given of the historic meeting of the World Trade Club of San Francisco, 18 June, 1919, when resolutions were unanimously adopted urging world metric standardization of weights and measures, and pledging the aid of the organization in securing this advance. At that meeting, the main address was given by Aubrey Drury, Associate Editor of the "Journal of Electricity."

In introducing the speaker, President W. H. Hammer said: "It gives me great pleasure to present Mr. Drury. He is a student of world business, and has devoted much time and study to

the question of the universal use of metric units, particularly in their relation to world trade.[1] Mr. Drury has given careful attention to the views not only of those who advocate the use of metric units, but also of those who have suggested objections. He is in a position to show that these objections are not well taken, and are insignificant as compared with the great benefits that would accrue, particularly to the manufacturer and the merchant, if metric units were employed thruout the world. You will note that Mr. Drury calls to his support men of high character, national eminence in achievement, and unquestioned ability—men whose deliberate judgments, based on sound reasoning and wide experience, must be heeded by those who seek the highest efficiency in world trade."

Editor Drury's address follows:

METRIC UNITS AND WORLD TRADE

By AUBREY DRURY

Mr. President, Ladies, and Gentlemen of the World Trade Club:

For some time past it has been my privilege to look into the extensive literature pertaining to world standardization of weights and measures. It has been my further fortune to become associated with many practical men who have made this a years-long study; and recently I have been in communication with some of America's leading thinkers—statesmen, bankers, world traders, manufacturers—in regard to this very important subject, particularly vital now at this period of renewed World Peace.

Thruout my investigation of world standardization, I have been struck with the practical unanimity of thought among experts who have gone into the subject, all of them advocating an advance to the units of the metric system, meter-liter-gram. Men whose business it is to search out the best methods for our commercial interests—for instance, the United States Government Secretary of Commerce and the Director of the Bureau of Standards at Washington—unqualifiedly favor the metric system.

It is because I wish to draw to your attention this notable testimony, because I think this matter should receive the furtherance of organizations such as yours, that I am glad of the opportunity to address you this evening.

[1] In November, 1919, Secretary-Treasurer William E. Hague started on a world trade tour of China, Mongolia, Siberia and other parts of the Orient. He was succeeded as Secretary-Treasurer by Aubrey Drury.

World War Showed Need of Metric Unity

The recent world war brought out a great many important and valuable truths, of which we were before perhaps not entirely aware. One of the most momentous facts that it revealed was this: that for efficiency in warfare—the most vital sort of efficiency needed—nations had to adopt thoro standardization of weights and measures. Long before the war our enemies had seen that and had built upon it. Germany adopted meter-liter-gram in 1871; and we saw in late years the tremendous advantage that the use of these metric units gave her.

Germany was able to co-ordinate all parts of her mechanical system, her production of war equipment and material—and in Germany everything was war material. With foresight and care worthy a better cause, she standardized trade, commerce, industry, education, by use of metric units, and as a result gained that gigantic military efficiency that was so much boasted.

Germany, also, because of these standardized units, found it easy to work in concert with Austria, Hungaria, Bulgaria and Turkey, because they also had the "gumption" to possess themselves of the metric system. Thus was her strength doubled or trebled.

How was it on our side? We found our nation striving to work with allies with whom we were not standardized. We found 30 allies using the metric system; but on the other hand, the United States of America and the British Commonwealths were not even employing systems identical one with the other.

Britannia, in order to gain efficiency in warfare, early in August, 1914, had to bring into use some of the metric units; and the United States of America, that her army might be truly efficient, was obliged to adopt meter-liter-gram for use abroad. War Department Order Number One, issued on 2 January, 1918, reads:

> "The metric system has been adopted for use in France for all firing data for artillery and machine guns, in the preparation of operation orders and in map construction."

Virtually the same order went into effect in all training camps thruout the United States of America. That may well be looked upon as one of the great victories of the war—recognition of the vital need of metric standardization to gain utmost unified war power.

Congressman Fiorello La Guardia, of New York,[1] who as Major in the Air Service commanded American air forces on the

[1] In 1921, Chairman of the New York City Board of Aldermen.

Italian front during the war, wired the World Trade Club, 17 May, 1919:

"I still have unpleasant memories of the difficulties experienced during the World War, of the loss of time and the confusion, owing to different systems of weights and measures used by various allies. We lost much time in translating specifications, and more errors were caused on this account than by anything else."

British and American Measures Not Alike

The World War showed us not only that we were incapable of highest co-operation with most of our 30 allies because of lack of metric units; the World War awoke us to another disconcerting fact. It has been a fond popular fallacy that the British and American measures are alike. The world reads in British and American books: "Pound, yard, quart," and so on, and thinks these old words have like significance in Britannia and America. But, in truth, the pound, yard, gallon, hundredweight, ton, bushel are none of them identical in the United States of America and Britain. They are even not the same thruout America.

The gallon is 20 per cent greater in Canada than it is in the United States. As a result the Canadians have made U. S. American gallons illegal for use in Canada, because American merchants might sell with their smaller gallons and gain an unfair advantage.

The Canadians have the British beer measure. The United States of America uses what is known as wine measure. Surely, in the light of current events, both may be looked upon as obsolescent.

As a matter of fact, the only liquid measure that is uniform thruout the Americas is the liter. It is legal in Canada, in United States of America, in Mexico and everywhere in Central and South America.

Diversity of measures exists not only thruout all Britannia; even in the United States of America there is no uniformity. There are more different bushels than there are states in the Union. The bushel varies according to the commodity measured. A bushel of bran weighs 20 pounds; a bushel of fine salt 167 pounds. And so it goes; our weights and measures are local, and bring about confusion everywhere. Joseph V. Collins, a deep student on this subject, writes:

"Counting the English units bearing the same names as our own, we have in use 4 different sizes of pints, quarts and gallons; 3 different sizes of gills; many sizes of barrels; an untold number of different sizes of bushels of things in different states,

such as apples, potatoes and the like; 3 kinds of ounces, drams and pounds; 2 different sizes of 100-weight, 4 different tons and 2 or 3 kinds of miles."

In other words, ours is a veritable anarchy of weights and measures—a lawless confusion little meriting the name of "system." We have here no uniformity, no standardization. It is a fact, until recently but slightly known, that this formidable jumble is of German origin, not of British. It was instituted by the old Hanseatic Trade League. They foisted it upon England, which in turn landed it onto America, while Germany displayed the rare judgment to scrap it altogether. Bound by blind tradition and inertia, we still hang on to it.

We pride ourselves upon our progressiveness; we are wont to say that we are more enterprising than the Latin peoples to the south of us. Yet here they are far ahead of us, for we cling to this old German clutter of measures while the Latin nations of the South have moved on to the progressive and scientific meter-liter-gram. Why, even in Timbuktoo and Borneo they use the metric units!

It would not be so astounding to look upon this spectacle of our blind adherence to these cumbersome measures, if there were not something ready to our hand for immediate use. But there is such a system ready-made—a time-saving invention, a labor-saving tool—the system of meter-liter-gram, which is worldwide in its application and is practically essential in world trade.

History of Metric Units

The history of the metric system I have not time at present to go into extensively. Suffice it to say that it is, so far as general application goes, about 136 years old. James Watt, that truly great Briton, the inventor of the steam-engine and so many other fundamentally great mechanical contrivances utilizing steam power, was really the man who thought out this ingenious yet simple plan of applying the decimal notation system to weights and measures, and got them into public use.

The United States, in 1786, adopted the metric system as to her coinage; Thomas Jefferson advocated and urged that great progression. But tho he worked steadfastly to get the legislators of America to adopt the other 3 principal units, which later came to be called meter-liter-gram, the legislators failed to do it then, and the United States has much to regret because of that failure. Even more cause for regret have we in the fact that in 1866, when the metric system was made legal by our Congress, it was not instituted as the only system to be used.

France, on the other hand, wisely adopted metric units exclusively in 1799, at the instance of Talleyrand. Country after country has since gone over to this logical system until to-day there are 40 important nations which use it as the sole standard, and over 200 countries in which metric units are used more than any others.

It is plain to see that this may rightfully be termed a **world system.** Its units are not merely local, as are our antiquated weights and measures. A World Bureau of Weights and Measures is maintained in Paris to keep uniform the metric standards for all the world. Both the United States of America and the British Commonwealths contribute to the upkeep of this important institution.

Such, briefly stated, is the history of the metric system up to the present; and it is for organizations such as the World Trade Club to make sure its future history, to help bring about the use of metric units exclusively by English-speaking peoples.

Simplicity of Decimal Plan

It is not requisite for me to explain to you the nature of the metric system. You all know that it is based upon the decimal plan; that its units are inter-related logically. Just as the 4 fingers of the hand are distinct yet are all parts of the hand, so are the metric units all integral parts of one system. Dollar-meter-liter-gram, the 4 principal units, are all handled absolutely the same. Just like the dollar, meter-liter-gram may be decimally divided or decimally multipled. By simply shifting the decimal point one can attain multiplication or division.

As to the relation of these units to our present customary measures: The meter is about 10 per cent longer than the yard; 500 grams is about 10 per cent larger than the pound avoirdupois; the liter is 5 per cent more than the U. S. American liquid quart, and 13 per cent less than the British liquid quart.

Now this logical system of weights and measures, meter-liter-gram, has come into use not only in those numerous countries to which I have referred, but also universally in a great many fields of our own activity. We find that the metric system is everywhere used in electricity, in medicine and science. The metric system is taught in all our schools; in technical schools particularly its use is emphasized. Furthermore, we use it to a great and ever-increasing extent in manufacture and commerce; but not to the degree that its merits demand. In these 2 important fields also its application should be made exclusive.

As Nicholas Murray Butler, President of Columbia University, wired the World Trade Club: "The adoption of the metric system by English-speaking peoples would advance world trade as it has already advanced science."

We have before us a simple proposition: A world standard is needed and a world standard is available. It is used by most of our competitors, and used so well that they will never go back to their former confusion. It has proved a success.

No Obstacle in Way of Advance

The question naturally arises: Why cannot we also use the metric system to our advantage? As a matter of fact, there is no serious obstacle in the way. Of course, there must be some readjustment. But as has been proved in the case of more than 200 countries, there is no immense problem. The transition may be made gradually and without much cost or trouble.

Most people recognize at once that the metric system is logical, easy to learn, easy to remember; that it has all the good points of our metric decimal coinage.

But there are a few who think that in a transition to metric units there will be some trouble involved; and an insurmountable amount of cost, perhaps. Most of such-like objections appear to come from a clique of professional objectors centered in New York, who have got themselves hired by certain manufacturers whom they have mesmerized into the fear that they are going to have their machinery plants suddenly scrapt by the universal adoption of metric units. Those manufacturers are being deceived. If they had time to look up for themselves the truth they would be the first to use the metric units—scrapping no tool, machine, nor any part of their plant equipment.

As to the alleged trouble of transition to the metric basis, the awkwardness is all on the side of the old system. The metric units are easiest to learn, to use, to remember. In countries and concerns that made this advance there was no difficulty. The

people of France, Germany, Italy are not more active mentally then we are. Are they as well educated? Are they as intelligently efficient? Can they learn as competently as we can? Yet they encountered no insurmountable difficulty in adopting the metric system. They did it. Cannot we do it as they did?

Americans who go to Cuba and the Philippines, Porto Rico and Panama—virtually parts of the United States—learn the system in 2 weeks' time, and find it easy to transact all the business of life with it.

It has been proved that the metric system can be learned in all its essentials in 10 minutes by school children of 10 who know the decimal ratio.

The transformation from one measuring system to another is made every day in factories of the United States and Britain which are going over to the metric units, and with no perceptible wastage.

Think of the confusion and trouble now of translating the old German jumble of weights and measures into and out of the metric system for purposes of world trade! Think of the time spent by the workers trying to use this antiquated jumble of weights and measures, with its numerous so-called **vulgar fractions**—and truly they deserve such an unpleasant name as that. There are no vulgar fractions in the metric system, and labor, time and trouble are saved as a result.

So much, then, to dispose of the supposition sometimes hazarded that it will involve considerable trouble to achieve this great progress.

Cost of Progress Is Microscopic

The question of cost is really the only obstacle which most men who oppose the metric system seek to bring forward. That is the one thing they fear. They are afraid of their pocket being touched.

Upon this matter of cost, let me recommend perusal of the report by S. W. Stratton, Director of the United States Government Bureau of Standards, Washington, D. C., whose business it is to have expert knowledge of this question, and who has made a thoro painstaking study of the cost of progressing to the metric units.

Stratton shows that the money spent in many cases will be zero; there is often an immediate monetary gain in making use of the decimal system. He notes the case of a manufacturer of locomotives, who made 100 locomotives for the Russian government upon the metric system of measurement, and found that he accomplished it without any more expense than in making them upon the old standard.

He cites the case of a packer and canner exporting to South America, who said that the change did not cost him a cent. The Director reports a great many instances of this kind.

F. O. Wells, President of the Greenfield (Mass.) Tap, Die, Machine Tool Co., which made so many things indispensable to carrying on the war, said the use of the metric system earned an additional annual dividend of $50,000 for the stockholders of that company—and cost nothing if instituted gradually.

Kynoch, the Krupp of the British Isles, made the change at an outlay equal to 1% of a year's dividend.

Transition Made Without Undue Expense

It is apparent, then, that the cost to the manufacturer is very often nothing. The same thing was proved in all the countries that now use the metric system. We have certainly heard no complaint from German, Italian or French manufacturers as to cost of transition. Let us recall that they underwent this same change and made no protest; they found it could be done gradually. There was no scrapping of scales or tools, of drawings or machines.

It is a matter of common knowledge that these things wear out in a few years and have to be replaced. Millions of dollars' worth of machines are thus scrapt every year. New machinery is demanded constantly, and this new machinery, made according to metric measurements at the time it is needed, will simply replace outworn equipment. A great many machines now used could be adapted—scale beams remarked, weights readjusted—at only nominal expense.

If there are any, however, of the manufacturers who complain that they would suffer financially because of this exclusive use of the metric world standard units, then we say, license the laggards if they can prove to competent governmental authority that they would lose money thereby. Let the government grant permission to them to continue with their old measurements. You would see them quickly follow the progressives in world standardization.[1]

Such was the experience of the Swiss republic. That government adopted the metric system, yet granted licenses to its watch-makers to continue the old system if they desired. Watch-makers did so for a short time, but soon realized that they were at a disadvantage in using the old units, and recognized the valuable advantages which they were letting slip by. So they voluntarily adopted meter-liter-gram exclusively and you could not get them now to use the old, obsolete system.

[1] It should be here pointed out that the Britten-Ladd Bill, before Congress in 1921-22, provides for exclusive use of metric units in merchandising after 10 years. Manufacturers may employ whatever measures they desire in production work.

There are, after all, no obstacles of trouble or expense which cannot be surmounted in this advance to the metric units.

Vast Educational Advantages

As to the great practical advantages of the metric system, much has already been said. There will be manifold advantages, for instance, in education. Charles W. Eliot, President Emeritus of Harvard University, by many considered America's most eminent citizen, wires the World Trade Club:

"The adoption of the metric system by the United States of America would greatly reduce labor in trades because of the thoro decimal quality of the system, and would facilitate teaching of mathematics and applied sciences in schools."

Thus does the greatest schoolman come out strongly for the metric system in education.

Joseph V. Collins, from whose valuable paper I have quoted, states and proves by tabular figures that in education the United States loses $315,000,000 yearly because of time spent unnecessarily in trying to learn the old system of weights and measures.

How many of you could repeat the old tables that we were supposed to learn in school and which so troubled our minds? Very few, I am sure. In education it is evident that there would be a great gain by adoption of decimal metric units.

There would be, too, a tremendous vital advantage in world war. We must be prepared. In case war should start again we must be equipt at the beginning with the very best of world standardization, at least equal to that held by the enemy.

World Trade Demands Metric Advance

In the field of world trade, the greatest benefits accrue. We must consider, first of all, the changing nature of our world trade. We are no longer sending out merely raw materials; we are more and more exporting manufactures. A statement made by William C. Wells, chief statistician of the Pan-American Union, is much in point:

"Where we sold lumber we are now selling chairs, tables, desks, and so on; where we sold pig iron we are now selling knives, plows, machinery, and so on. Where we formerly sold raw cotton we are now steadily increasing the sale of cotton wrought into the completed articles or parts of articles. Our changing world trade demands a change to metric units. Clinging to this old lack of system is sufficient to hold us back from first place as an exporter of highly wrought manufactures."

Of the world's automobiles probably 80% are made in America; about the same proportion holds true of type-writers, tele-

phone instruments, linotype machines, cash registers, calculators, slide rules, sewing machines and the like; and these appliances, in order to sell and firmly hold the trade to the best advantage the world over, ought to be made so as to conform to the world-wide customary units of the countries to which they are sent. In the long run, we shall have them made according to metric standards. To hold the trade we must render real service satisfactorily to countries using meter-liter-gram.

Let me cite an example: A great oil-field equipment company with offices in Louisiana, Texas and California, sent $1,000,000 worth of supplies and pipe lines to Rumania, to be installed there; but at the last moment it was found that they could not be economically installed in Rumania, because of the impossibility of having quick, adequate and cheap repairs made in that country, except on metric lines. Therefore it was deemed impossible to accept all this costly and bulky material which had been shipped to far Rumania.

That constituted a great loss to American commerce, and something similar is happening every day. We do not perhaps realize the extent to which this evil reaches; nor think about the profitable, wage-paying orders which we miss, which we can never harvest until the metric units are used altogether in American manufacture and American trade.

Metric Units to Facilitate Merchandising

There is an immediate connection always between the production of goods and the merchandising of goods—that is something for our merchant-manufacturers to contemplate.

Think of the vast advantages in merchandising goods thruout all the world using a uniform system of weights and measures. Think how we could put this time-saving tool into operation everywhere. How convenient it would be for us, also, to utilize this "world language of quantity."

We Americans take pardonable pride in our ingenious labor-saving devices. We have invented and used a great many, yet appear reluctant to accept **the greatest of them all,** the invention of one of our own race, James Watt. That strange reluctance is entirely at variance with the pioneer spirit of our nation and with the progressive age in which we live.

Imagine the convenience of cataloging and quoting in metric units to the world that uses the metric units, without need to translate. We should not then have to prepare 2 sets of figures, to be puzzled over, erred over and transposed. Our catalogs and price lists would be the same everywhere and understood everywhere.

Think of the benefit of being able to use our calculating machines not only for dollars but also for meters, liters, grams. The British cannot even employ calculating machines satisfactorily in financial transactions, because they cling to an antique German coinage, inherited from the Hanseatic Trade League, with its pounds, shillings, pence, farthings, and so on.

That we would gain in accountancy everywhere in every business by the adoption of meter-liter-gram is an assured fact.

New World Trade Conditions

It is evident that the United States, in order to have a fair chance, must be on an equal basis with her competitors in the gigantic after-the-war struggle for world trade.

A member of the World Trade Club, John H. Gerrie, financial editor of the San Francisco **Bulletin** and an acknowledged high authority on world trade, has well said that the United States is entering on this fierce competition **equipt with the wrong kind of tools.** He says editorially that we are using antique devices striving to compete with nations equipt with the best and most up-to-date instruments of education, finance and commerce.

William C. Redfield, United States Government Secretary of Commerce, made a convincing comment upon this very point in an address before the American Association for the Advancement of Science. He declared:

"I have heard men say that America can sell and is selling quantities of goods abroad without the use of the metric system. Certainly that is true. She can do that to a certain extent, but compared with what America can do if she will adapt herself to the needs of the people abroad, **it is like selling remnants.**

"The day when any nation engaged in industrial production could impose its ideas on any other nation to which it desired to sell goods has gone by, and the only way in which you can sell goods now is to sell people exactly what they want—or they will get what they want from your competitor.

"If we want to throw the business of the United States into the hands of a Germany of the future, or into the hands of the French steel manufacturers, or if we wish to develop the business of the Netherlands, Denmark, Italy or Spain, we can accomplish this end by confining ourselves to the foot-and-inch units, which do not work well in other countries and which the world will not have."

Metric System Almost Universal in World Trade

We have seen that the use of the metric system is almost universal in world trade. It is used in Europe by all of the nations with the

single exception of the British Isles. In Africa it is found in the colonies of France, Belgium, Portugal, Italy and Spain. Looking to the Orient, we find the same colonial powers with vast commercial dependencies, which all accept the metric units. The Dutch East Indies, for instance, constituting a great field for trade to be reached from our port of San Francisco, use metric units. So do Japan, the Philippines, Siam, Indo-China, Siberia.

In China the government after looking over the entire field of weights and measures, decided to gradually turn its 426,000,000 humans over to the exclusive use of metric units. They are the standards for 28 treaty ports at the present time.

In Latin America particularly we need the world system. Theodore C. Search, successful manufacturer, founder and first President of the American National Association of Manufacturers, stated before Congress that everywhere in Latin America you will find that you come into contact with meter-liter-gram. J. W. Sanger, trade expert recently sent out by the United States Government, confirmed that report; and the same message is carried in late bulletins of the Bureau of Foreign and Domestic Commerce.

John Barrett, a former San Franciscan who has gained world fame as the Director of the Pan-American Union, is an ardent advocate of the metric units for U. S. America. He has served as a member of the executive committee of the American Metric Association, which urges the exclusive use of metric units.

In Latin America it is apparent that if we wish to build our trade upon a solid foundation so that we can hold it, we must be on a parity with our competitors and we must thoroly utilize the metric system.

Unanimity of Opinion for Metric Standards

It has been my purpose to indicate the unanimity in favor of metric units. To quote all the commendatory statements received by the World Trade Club would take a very long time. Let me at least mention the names of some of the notable men who have written, or wired, or aided the World Trade Club in advocacy of the metric units.

Here are a few: Andrew Carnegie, Henry Ford, John Hays Hammond, George Otis Smith (Director of the Geological Survey), Franklin D. Roosevelt, Frank L. Polk, Henry van Dyke, Judge E. H. Gary, James Speyer, Albert Bushnell Hart, Theodore N. Vail, Alexander Graham Bell, Otto H. Kahn, George W. Perkins. This may well be termed a Supreme Court—yet its number might be much extended.

I wish to read to you one communication which I consider particularly important, of great weight and authority, sent by William G. McAdoo, wartime Secretary of the Treasury of the Government of United States of America, and Director of its 268,000 miles of Railroads. He wired, 16 May, 1919:

"I heartily applaud activities of the World Trade Club in favor of legislation providing for exclusive legality within the United States of America of decimal metric system of weights and measures. Any legislation enacted would of course take due care of commercial interests during reasonable period of transition; and consequently alarm because of the change is wholly groundless. A very great stimulus indeed would be effected by our accepting the metric standards of industry, education and science now in use thruout the world. Shall we in this striking instance fail to adjust ourselves to the requirements of progress?"

As Mr. McAdoo has said, more recently, "A very important thing is the adoption of the metric system. It was the most unhappy event that the metric system was ever defeated when it came up here—a monumental mistake. If taken up seriously and applied intelligently we could get it transformed in a few years, and it would do more for the development of trade than anything ever yet attempted."

One of the most eloquent appeals ever made in behalf of the metric system was that of Charles Sumner in the Senate of the United States of America, 1866. He declared:

"A system of weights and measures born of philosophy rather than chance is what we seek. To this end old systems must be abandoned. A chance system cannot be universal. Science is universal; therefore, what is produced by science may find a home everywhere."

Business Men to Bring About Metric Advance

But it is not primarily to the men of science that we must look for the utilization of this beneficent utility. The scientists have long used the metric system and are thoroly satisfied with it. Those who must be counted on to put this great utility into effective use are the practical men—manufacturers, merchants, business experts.

It is for the other business men, I think, to help convince the manufacturers that it is to their manifest interest to go over gradually to metric units. There is, as I have tried to emphasize, a very close relation between the making of goods and the merchandising of goods. It is for world traders to show factory managers that they can sell more goods at less expense ratio by adopting metric standards than by adhering to the antiquated

units which we now have and which the world in general will not have.

American manufacturers will, by using metric units, get big business otherwise unobtainable. Without metric units they can not hold much business they now have. It will be taken from them by metric Europe or metric Japan just as soon as metric manufactures are readjusted for world work.

Merchants Great Educational Influence

The merchants, the traders, have in all probability constituted the most potent educational influence in the world's history. Above all, they have given us "the tools of intellectual communication."

We all know that we owe our alphabet to those ancient Phoenician merchants who were borne by their purple sails out from Sidon and Tyre; we know that from the merchants of the Middle Ages we gained the science and arts of the East, which they carried back from the Crusades. A humble Genoese trading-skipper, Christopher Columbus, proved to doubting scientists that the earth is round, discovered a new world, and created a new geography.

The Arab merchant Musa brought the decimal notation out of India about the year 900. To a mobile merchant of Italy, one Leonardo of Pisa, we are indebted for general knowledge of this so-called Arabic decimal notation (it is really of Hindu origin) which he urgently advocated about the year 1200, and which, by the way, most of the universities then actively opposed, insisting that it was not as good as the ancient Roman numerals—which are used now chiefly upon grave-yard granite.

On that invention and utilization of the Hindu science of positional decimal arithmetic might be said to be based our whole modern business life. Upon that, certainly, is founded the essential system of weights and measures which I am advocating.

In the merchants of the United States of America and the British Commonwealths confidence may safely be placed to continue in the work of world education, which seems to be theirs by right of enterprise. They can be trusted to confer another great benefit on all humankind, to aid powerfully in carrying into effect everywhere among English-speaking peoples the universal language of quantity, meter-liter-gram.

CHAPTER 14

"LOOK IT UP"

WORLD METRIC LITERATURE CLUES

A List of References to Books, Pamphlets, Documents and Magazine Articles Urging Metric Standardization of Weights and Measures.

These References Were Prepared by
CLIFTON HILDEBRAND
Member of the World Metric Standardization Council; member, World Trade Club; awarded Joffre Gold Medal on world affairs.

TABLE OF CONTENTS

PAGE
REFERENCE BOOKS 439
BOOKS AND PAMPHLETS:
1. American Metric Association 439
2. London and Manchester Decimal Associations 441
3. World Trade Club 444
4. General Works 447
U. S. AMERICAN OFFICIAL DOCUMENTS 452
U. S. American Trade Reports 459
BRITISH PARLIAMENTARY REPORTS, ACCOUNTS AND PAPERS 467
PERIODICAL PUBLICATIONS 469

REFERENCE BOOKS

See "Metric System" and "Weights and Measures" in the following: Century Dictionary and Cyclopedia, China Year Book, Encyclopedia Americana (article by S. W. Stratton), Encyclopedia Britannica, Heaton's Annual, Latin American Encyclopedia, Machinery's Encyclopedia, Medical Dictionaries (Stedman, Cattell, Lippincott, Gould); Nelson's Encyclopedia, New Hazell Annual and Almanack, New International Encyclopedia, New York Tribune Almanac, Official Digest of the World, Scientific American Reference Book, South African Year Book, Whitaker's Almanack, World Almanac and Encyclopedia.

BOOKS AND PAMPHLETS

1. Issued by

AMERICAN METRIC ASSOCIATION

"A Message from the Secretary of Commerce of the United States of America." *See* also "Redfield" under "U. S. American Trade Reports."

"If we want to throw the business of the United States into the hands of a Germany of the future, into the hands of the French steel and iron manufacturers in that line, if we wish to develop the business of Holland, Denmark and Spain we can do it perfectly well, and build up the business of those countries at the expense of our own, by confining ourselves to feet and inches, which do not work well in other countries and which the world will not have."

Annual Reports and Pamphlets, 1916-1922.

"If we are to become commercially powerful in world trade, now knocking at our doors, we must furnish goods in world weights and measures. The adoption of the World Metric System by Germany, immediately following the Franco-Prussian War of 1870, undoubtedly was a large factor in the unprecedented success of her world commerce campaign."

Drake, F. R., "Address before the 4th National Foreign Trade Convention, at William Penn Hotel, Pittsburg, Thursday, 25 January, 1917, on the Metric System in Foreign and Domestic Trade." *Also, In* Official Report of the 4th National Foreign Trade Convention, 25, 26, 27 January, 1917, National Foreign Trade Council, 1 Hanover Square, New York City, See pp. 244-250.

American National Wholesale Grocers' Association each year has affirmed its position favorable to the adoption of metrics for all purposes in United States of America. Use and urge others to use metric equivalents on all labels.

Drake, F. R., "The Metric System from the Standpoint of the Wholesale Grocers and Canning Industry." Reprinted from Scientific Monthly, March, 1917. *See* also "Drake" under "Periodical Publications."

"We believe that the adoption of the metric system by Germany, embodying, as it did, the casting aside of many traditions for the sake of efficiency, had a great deal to do with the wonderful success of Germany as a world commercial power. The change at the time she made it was a much more radical one for Germany than the change for the United States would be now, for we are already using it in many branches of the government service, including now, aeronautics, as well as in scientific lines and commercial life."

Kunz, G. F., "Weights and Measures as Affecting Pan-American Unity." (Read at the afternoon session of 4 June, 1919, of the Pan-American Congress, held at the Pan-American Union Building, Washington, D. C.) *See* also "Kunz" under "U. S. American Official Documents."

"The common adoption of the metric system by the states of Latin America is already a bond of union among them, and its general adoption in the United States and Canada would bring both the Americas into agreement in this particular. The commercial advantages afforded thereby is a most important argument in favor of this, entirely apart from the superlative merits of the logical metric system, when compared with the many and chaotically related units of other systems."

"Metric Weights and Measures."

Concise facts about metric units with conversion tables. The folder has been prepared with the careful co-operation of experts in the United States of America and Canada, approved by government officials, and pronounced a reliable guide. (Postpaid, 20 cents.)

American Metric Association, 156 5th Avenue, New York City.

2. Issued by

LONDON AND MANCHESTER DECIMAL ASSOCIATIONS, BRITISH ISLES

Allcock, H., M. I. E. E., A. M. I., Mech. E., "Commentary upon the Findings of Lord Balfour of Burleigh's Committee with Regard to Decimal Coinage and the Metric System." Reprint from Nature, 6 June, 1918. *See* also "Allcock" under "Periodical Publications."

Allcock, H., M. I. E. E., A. M. I., Mech. E., "The Decimal System of Coinage, Weights and Measures."

Brochure urging exclusive use of metric units, published by the author, being a reprint of his lecture delivered 27 March, 1917, before the members of 5 British engineering institutions in joint meeting.

Allcock, H., M. I. E. E., A. M. I., Mech. E., "Great Britain's Interest in the Metric System of Weights and Measures." Reprint of article contributed to Electrical Review, 1 March, 1918.

Allcock, H., M. I. E. E., A. M. I., Mech. E., "Industrial Reconstruction and the Metric System."

The necessary expansion of Unitannian [U. S. American plus Britannian] export trade coupled with the establishment of new industries and of new standards in old industries, calls for a reconsideration of the necessity for exclusive adoption of World Metric Units as the universal language of quantity.

"Annual Report, 1919, London Decimal Association."

"Now that external commercial relations with the rest of the world, and particularly with Latin America, are developing with leaps and bounds, manufacturers and exporters must meet the demands of prospective customers in a more accommodating manner than hitherto. The English-speaking nations [Unitannia] alone stand aloof in the adoption of metric weights and measures."

Barker, A. F. (Director of Textile Industries, Bradford Technical College, British Isles), "A Practical Experiment in the Employment of the Metric System in Textile Industries."

Barker, A. F. (Director of Textile Industries, Bradford Technical College), "The Unification of Weights and Measures in the Textile Industries: the Possibilities of the Metric System."

Extracts from this and the preceding pamphlet will be found in Chapter 10, "What Will Metric Standardization Cost?"

Chedville, D. (Vice-President of the Chamber of Commerce of Elbeuf, and Vice-President of the Permanent International Committee for the Uniformity of the Counts of Yarn), "The Metric System and the Textile Trade: A Reply; Translation of the paper read at the Congress of Commerce and Industry held at Tourcoing (France), July, 1906."

French manufacturers entreat their colleagues and brothers in trade thruout Unitannia [the English-speaking countries] to go beyond narrow considerations and only to look at the benefit the textile world would derive by an agreement on metric standardization.

"**Decimal Coinage**: The Existing British Coinage Re-arranged on the Decimal Basis."

Economic considerations demand the expansion of British export trade to its utmost limit, and in order to encourage overseas purchasers to trade with the British Isles all hampering influences must be removed.

"**The Decimal Educator,**" from September, 1918, to date. The official organ of The British Decimal Association, established to promote the adoption of decimal coinage, and of metric weights and measures in the British Isles.

Britons (and Americans) bound by "chains of habit." Adopted weights and measures of old German Hanseatic League. Still use the units scrapt by Germany. Teach them in our schools while our neighbors consider us fools. Should use more efficient means to keep wits supple than complicated jumble of weights and measures. Must remove intolerable barrier to world trade.

"**A Few Opinions** on The Decimal Association's Lectures."

Metric standardization is an instructive and interesting subject. It is erroneous to believe that this is a tiring and academic study. It is within the practical province of the business man.

"**Extracts from the Evidence given by Lord Kelvin,** before the Committee on Coinage, Weights and Measures of the House of Representatives of the United States of America on the subject of the Metric System of Weights and Measures, 24 April, 1902."

"I believe I am not overstating the truth when I say that half the time occupied by clerks and draftsmen in engineers' and surveyors' offices, I am sure at least ½ of it is work entailed upon them by the inconvenience of the present farrago of weights and measures. The introduction of the world metrical system will produce an enormous saving in business offices of all kinds—engineering, commercial, and retail shops.

"Nothing can be more convenient than the world metric units for every kind of business and science. There is no case, large or small, in respect to measurement where the world metrical system is not satisfactory."

"Is a Duodecimal System Possible?"

"The prospect of having to learn new multiplication tables, and to become familiar with the new significance of numbers is assuredly not an alluring one. Put briefly, that is exactly what we should have to do if the Duodecimal System were adopted; and it is certainly a little curious that those who object to the metric system on the score of the inconvenience it would cause should recommend for our adoption a system which the people of this country could never learn."

"Report of Debate on the Metric System in the House of Representatives of the Commonwealth of Australia on 4 August, 1910."

Keen industrial fight going on in all directions. The country which refuses to keep abreast of the times will be left behind. Unitannia [the English-speaking countries] cannot afford to continue longer with obsolete weights and measures. Germany and other metric countries are rapidly gaining in the markets of the world.

Reprint from The Parliamentary Debates, 23 February, 1904.

"The disadvantages under which we are laboring, and which it is the object of this Bill to remove, may be classed under 3 heads: (1) The loss both in time and money which is involved in business and trade within our country; (2) the serious waste of time in the education of children of all classes caused by the teaching of complicated tables of weights and measures and their application to arithmetic; and (3) the lamentable loss of our commerce with foreign countries thru the use of weights and measures which are perfectly incomprehensible to foreigners who are accustomd to use the simple metric system."

Siemens, A., "Bradford and the Metric System, Report of Discussion at Meeting of the Bradford Textile Society on 17 November, 1913."

Commission representing Federation of German States in 1861 examined British weights and measures with view to uniformity. But when they saw the British weights and measures and went into them they shuddered and unanimously decided that meter-liter-gram were the **only possible world units.**

Sir Hiram Maxim, the great engineer, said: "I cannot understand why we stick to these weights and measures. There was only one man who knew the English weights and measures; he studied them for 30 years and he just knew them all when the poor fellow went mad and died."

"Statement Submitted to the Dominions Royal Commission by The Decimal Association on 4 October, 1912."

"The chief reason for the abolition of the British weights and measures and the substitution for them of the units of the metric system is that our weights and measures are not understood by foreign buyers, who often prefer to deal with our competitors, who use weights and measures which they are accustomed to." Proof given by citing extracts from consular reports and presentation of other evidence.

The Decimal Association, 229-231 Finsbury Pavement House, London, E. C. 2, British Isles.

3. Issued by

WORLD TRADE CLUB

1. Keep the World War Won.

Tells how the World War brought out the vital need for metric standardization, and shows peace-time need of the metric system thruout the world. (Postpaid, 6 cents.)

2. An Evening at the World Trade Club.

Reports a meeting at which Aubrey Drury addressed the members, after which unanimous resolutions were passed urging metric standardization. (Postpaid, 25 cents.)

3. Metric Units to Unite the World.

Reprints the report of the famous Carnegie Metric Committee of the American National Manufacturers' Association, urging metric standardization. (Revised to date by the chairman of the committee.) Also reprints articles by A. E. Kennelly, Wm. C. Redfield, and Harry Allcock, M. I. E. E. (Postpaid, 10 cents.)

4. Who Urges Meter-Liter-Gram?

(United States of America and British Commonwealths.)

Lists names and contains statements of typical metric supporters, among them such men as Thomas A. Edison, Alexander Graham Bell, Charles W. Eliot, Samuel Gompers, General John J. Pershing, Henry Ford, R. T. Crane, John Hays Hammond, Theodore N. Vail, Otto H. Kahn, William G. McAdoo, Franklin K. Lane and thousands more. Manufacturers, officials, merchants, engineers, authors, educators, physicians, jurists, clergymen, accountants, and many important commercial and civic organizations. (Postpaid, 25 cents.)

4. "Who Urges Meter-Liter-Gram?" (British Edition.)

A supplement to the American edition of "Who Urges Meter-Liter-Gram?" Issued thru the British Decimal Association as one of the World Trade Club series, with the co-operation of the World Trade Club and the World Metric Standardization Council. Lists names and contains statements of typical metric supporters thruout Britannia. (See Chapter 11, this volume.)

5. Who Opposes Meter-Liter-Gram?

Points out the small minority opposed to metric standardization, and tells the detrimental effect of their opposition upon themselves, and upon the efficiency of industry and of our national life. (Postpaid, 2 cents.)

6. World Trade Club Attacked.

Reply by John H. Gerrie, Business and Financial Editor, San Francisco "Bulletin," and Editor of "Pan-Pacific," to an unwarranted attack on the World Trade Club because of its advocacy of metric standardization. (Postpaid, 2 cents.)

7. Who Suffers?

A statement of the detrimental effect of lack of metric standardization in world war, in world work, in world education, in world health, and in world trade. (Postpaid, 4 cents.)

8. "Look It Up"—World Metric Literature Clues.

An index to books, pamphlets, official documents, and periodical articles urging metric standardization. (Postpaid, 10 cents.)

9. A 15th-of-a-Second World.

A book for teachers and other members of the civic service. (Postpaid, 10 cents.)

10. World Trade, World Unity and Metric Standardization.

Speech of W. H. Hammer, President of the World Trade Club, presented before the American Association for the Advancement of Science. (Postpaid, 5 cents.)

11. The Universal Language of Quantity—Meter-Liter-Gram.

Speech of Wm. E. Hague, prepared for presentation before the American Association for the Advancement of Science. (Postpaid, 5 cents.)

12. What Will Metric Standardization Cost?

Testimony on the slight cost and little difficulty of adopting metric standards, by such men as Andrew Carnegie, Alexander Graham Bell, Arthur Chamberlain, F. R. Drake, Lord Kelvin, Arthur E. Kennelly, William C. Redfield, Alexander Siemens, S. W. Stratton, Samuel Vauclain, and many others. (Postpaid, 50 cents.)

13. Metric Units of Weight and Measure.

British Parliamentary Report, 1862, urging metric standardization. (Postpaid, 10 cents.)

14. Some Significant History.

British Parliamentary Reports, 1862 and 1904, and U. S. American Congressional Report, 1866, all urging metric standardization; together with some striking historical facts.

"The Metergram," magazine published by the World Trade Club recording current news on the metric advance. (Numbers 1 to 7.)

Contains such articles as "World Trade Needs Meter-Liter-Gram"; "Unitannian Gumption" (editorial quoting Herbert Newton Casson, efficiency expert); "A. E. F. Learned to Use Metrics Easily"; "Metric System in India Recognized"; "Metric Units Suit All Latin-America"; "Metric Units to Unite the World," and so on. Number 7 of "The Metergram" is particularly important, containing the leading article, "Last Objection to Metric Standardization Removed," with statement by A. E. Kennelly showing that the metric advance can be achieved without "scrapping" of production machinery, as alleged by obstructionists. Furthermore, the World Trade Club makes this constructive proposal: "If any concern can show that they would be handicapt, license them to continue using old equipment."

In Number 2 of "The Metergram" is an editorial, on **"The Metric Procession,"** outlining the steady advance to metric standardization thruout the world since 1783, when James Watt proposed a decimal system of weights and measures. "Legalized thruout Unitannia (United States of America and the British Commonwealths), the next step is for the metric units to become the exclusive standards. This should be done thru a definite, forward-looking piece of legislation giving ample time and opportunity for gradual adoption of metric standards. It can be done **now.** Many industries are willing and ready. Those who feel unready may be licensed to keep the old jumble for a period of years. National legislators of Unitannia should awaken to the need and demand for the simple decimal metric standards in industry and in education. But Unitannia cannot wait for the awakening of legislators. The industries thru their organizations can and will standardize themselves, without waiting for the legislators.

"The procession starts, beginning now. Organized Unitannia advances on metric units:

"(1) The leaders, already standardized—Science, aviation, electricity, heat, light and power plants, radio-telegraphy, pharmacy, optometry, photography, physics, chemistry, seismology, astronomy, microscopy, and so on; and jewelers, who use the world carat of 200 milligrams. (2) Keepers of the health of Unitannia, physicians, doctors, hospitals, druggists, chemists, and all medical sciences. (3) The electrical industries, telephone, telegraph, airgram, radiograph. (4) The armies and navies of Unitannia. (5) Growers of food, distributors, grocers, canners, packers, fruit preservers, foresters, the makers and purveyors of food, who realize the need of simple decimal computation. (6) The steel industries, following the counsel of Andrew Carnegie. (7) Education—all teachers and educators of Unitannia led by Charles W. Eliot, Nicholas Murray Butler, Arthur T. Hadley, David Starr Jordan, David P. Barrows, and innumerable other educators. (8) Manufacturers—led by Ford Motor Company, Truscon Steel Works, Goodyear Tire & Rubber Company, Crane Company and many other important concerns. (9) Authors, clergy, artists, musicians, lawyers, accountants. (10) Machine tool makers, and finally, (11) **Legislators.** These are some of the groups who have adopted or will in succession adopt meter-liter-gram."

4. GENERAL WORKS

"American Metric Bureau Bulletins," U. S. American Metric Bureau, numbers 1-6, 19-30, 1876, 1878.

Melvil Dewey, Pre-eminent Librarian, Former Chancellor of University of the State of New York, originator of Dewey Decimal Classification and founder of the world-famed New York State Library School (in 1878 Secretary of the American Metric Bureau):

"We have found the press everywhere interested in the introduction of the decimal weights and measures thruout the world, and we invite your co-operation in forwarding this important work. The surest, if not the only way to accomplish this, is thru educating the people in the advantages of this World Metric System. In no other way can the public be reached so effectively as thru the press; and the American Metric Bureau has, therefore, voted to appeal directly to the editors of all the leading journals of the country."

Arnold-Forster, H. O. (Recently British War Minister), "Coming of the Kilogram." 3d edition. Cassell & Co., 43, 45 East 19th Street, New York City. 1905. 70c.

"The object and the aim of the book is to make British and Americans [Unitannians] realize the position in which they stand in the competition of the civilized world, and to show them exactly what it is that they are risking by clinging to their present weights and measures while every other civilized nation in the world has adopted the metric units."

Barnard, F. A. P., LL. D., "The Metric System," Boston, Massachusetts, U. S. America. 1879, pp. 348-360.

Contains a list of 391 different units of weight to which the word "pound" applied and 282 different units of length to which the word "foot" applied.

Barnard, F. A. P., LL. D., "The Metric System of Weights and Measures" (an address delivered before the convocation of the University of the State of New York, at Albany, 1 August, 1871). Printed by order of the Board of Trustees of Columbia College, New York City, 1872. *See* also "Barnard" under "Periodical Publications."

Bayer, H. G., "The Metric System in All Its Details Compared with the U. S. American Weights and Measures." H. G. Bayer, 21 Park Row, New York City. 1912. 99c by mail postpaid.

A treatise especially prepared for the student, merchant, importer, exporter, manufacturer, engineer, architect, jeweler and financier.

Bayer, H. G., "The Metric System in a Nutshell, and 20 Tables of Equivalents." H. G. Bayer, 21 Park Row, New York City. 1912. 37c by mail postpaid.

Intended for ready reference by the business man.

Cajori, F., "A History of Elementary Mathematics." Macmillan Co., 66 5th Avenue, New York City. 1896. (*See* pp. 152, 178, 179.)

Carnegie, Andrew, "Life of Watt." Doubleday, Page & Co., Garden City, New York. 1905. $1.40. *See* pp. 175-177.

Watt worked out metric scheme as result of difficulties encountered in studies of world writers on chemistry; and got in worldwide use.

Chamber of Commerce of the United States of America. "Advice to Directors Regarding Metric Referendum." (National Council Meeting, 8-9 February, 1922.) National Headquarters, Washington, D. C., 1922.

This pamphlet contains report of Metric System Committee of the Chamber of Commerce of the United States of America. Recommends calling nationwide Referendum on gradual adoption of the world metric units by the United States, the Committee reporting **unanimously** in favor of this Referendum. The pamphlet contains summary of arguments for and against the metric advance.

Davies, C., "The Metric System Considered with Reference to Its Introduction Into the United States; Embracing the Report of the Honorable J. Q. Adams." A. S. Barnes & Co. 1871. *See* also "Adams" under "U. S. American Official Documents."

Evennette, C. T., "Combination Metric Ready Reckoner," McGraw-Hill Book Co., 239 West 39th Street, New York City. 1917. 25c.

Gray, H. B. (Member of the Mosely Educational Commission to U. S. A.; so on) and **Turner, S.**; joint authors. "Eclipse or Empire?" Nisbet & Co., London, British Isles. 1920. *See* pp. 174-179: Metric System.

"No man on earth who makes anything, sells anything, or keeps accounts concerning anything that is imported into, or exported out of, British Isles but must admit that it would not only be a great convenience, but a source of great economy if British Isles and every country she trades with (that is, all the world) had one common system of Weights and Measures and Coinage, so that one sign meant the same size to every worker in the world, and one figure the same value to every book-keeper.

"There is a growing feeling in favor of doing something to bring about an adoption of one system by the leading manufacturing countries of the world in order to facilitate still further that exchange of commodities which we call Trade. There is no possibility of any other nation being persuaded to use the British weights and measures, and it becomes daily more apparent that if we persist in retaining them we shall eventually be left to use them **alone.** Even China has instituted a system of weights and measures that is based entirely on the metric system.

"It follows that as a universal system of weights and measures would be of advantage to commerce, we (Britain) as the commercial nation of the

© Harris & Ewing, Washington, D. C.

HON. FRED A. BRITTEN
United States Congressman from Illinois
(Metric Leader in the House of Representatives)

© Bachrach, Washington, D. C.

HON. EDWIN F. LADD
United States Senator from North Dakota
(Metric Leader in the Senate)

world must substitute for our own that system which is evidently well on the road to be universal. That we must do that is clear, even if there were any doubt (which of course there is not) of the metric and decimal systems being better than our own. So much in the interest of logical ideals. But where logic appeals to the few, interest appeals to the many; and that **our interests have suffered incalculable damage** by our persisting in sticking to our insular system of weights and measures no man who has studied modern business conditions can have any doubt."

Granger, O., "Metric Tables and Problems." C. W. Bardeen, 317 East Washington, Syracuse, New York. 25c.

Hallock, W., and Wade, H. T., "Outlines of Evolution of Weights and Measures and the Metric System." Macmillan Co., 66 5th Avenue, New York City. 1906. $2.25.

"The successful prosecution of world commerce requires a complete understanding between merchants in different countries as to each other's standing, methods of payment, and, most important, as to the goods themselves which form the subject of the transaction. Aside from standards of quality, quantities and dimensions must be considered, and it is here that universal measures and standards are needed. It is also of importance for both buyer and seller to know the quantity of the commodity in existence at different places, the quantity produced and consumed in previous years, and other statistical information. As regards the latter, it will readily be seen that the collection and diffusion of such knowledge would be facilitated if the same units were used in every country and port of the globe, and trade could then be carried on in a more intelligent manner."

Hamilton, Alexander. Advocate of decimal uniformity. See his Life, Works.

Hatch, F. H., "Weights and Measures of International Commerce." Macmillan Co., 66 5th Avenue, New York City. 1907. 80c.

Jefferson, Thomas, "Writings." Published by Taylor & Maury, Washington, D. C. H. A. Washington edition, 1853 (pages differ in other editions), vol. 5, pp. 236, 377, 378; vol. 7, pp. 87-89, 473; vol. 6, p. 12.

To Thomas Cooper; Coinage, Weights and Measures Report; to J. Dorsey; to J. Q. Adams. Wanted standard on decimal base. Would introduce facility into primary arithmetic and substitute easy ratios for complicated ones. Would better enable whole mass of people to compute for themselves whatever they buy or sell.

Logan, F. W. A., "English Weights with Their Equivalents in Kilograms." Spon & Chamberlain, 123 Liberty Street, New York City. 1907. 50c.

McCartney, H. P., "Metric Weights and English Equivalents." Spon & Chamberlain, 123 Liberty Street, New York City. 1907.

50c. *Also* E. & F. N. Spon, Ltd., 57 Haymarket, S. W., London, British Isles. 1907.

Macfarlane, J. J., "Conversion Tables of Foreign Weights, Measures, and Moneys." 3d edition. World Commercial Museum, 34th Street below Spruce, Philadelphia, U. S. America. 1915. 50c.

Martin, A. J., "One Language in Commerce." T. Fisher Unwin, Adelphi Terrace, London, British Isles. 2s. 6d. Contains tables and information on British and World Weights and Measures.

"There are many ways in which the 'waking up' process can be accomplished.

"It is principally the British Parliament which should wake up, there being more people alive to the situation than many of its members seem to suppose. Surely British mechanics have quite the intelligence of the Japanese, who spontaneously made the change.

"The British have spent hundreds of millions of pounds to uphold their military prestige. Why should Parliament hesitate about the small expense in replacing existing measures, weights, and index plates to spring and lever scales, and supplying local authorities with metric standards, and schools with metric models?"

"To sell to a man you must convince him."

"To convince a man you must talk his language."

The language of "Unitannia's" richest potential customers in relation to weights and measures is meter-liter-gram.

Martin, A. J., "The Metric System in Its Relation to the Surveyor's Profession." The Surveyors' Institution, 12 Great George Street, Westminster, S. W. 1, London, British Isles. 6 May, 1918.

"The use by our commercial rivals of calculating machines and slide rules based on logarithmic tables has for many years given them a great and growing advantage over us in factories, in the office, on the farm, and elsewhere.

"It is impossible for us to use these rapid businesslike methods for multiplying or dividing unless, instead of a conglomeration of measures and weights, we have a 'system' of measures and weights (1) with a common radix—or regular system of multiples and submultiples between the units—thruout, and (2) in which the measures and weights are inter-related."

"The Metric System." Hartford Steam Boiler Inspection and Insurance Co., Hartford, Connecticut, U. S. America. 1898. *Also* 1915 edition. $1.25.

"The Metric System," *In* Hughes' Civil Service series, Hughes' Academy, 82 Royal Avenue, Belfast, British Isles. 16 October, 1916. 6d. 70 pp.

"Metric System." Reports from Her Majesty's representatives abroad. Part 2. Eyre & Spottiswoode, East Harding Street, 33 Paternoster Row, 13 Paternoster Square, E. C., London, British

Isles. 1901. 2½d. *Also, In* British Parliamentary Accounts and Papers, vol. 80, 1901.

Shows ease of transition to metrics in various countries. Gives extracts from metric laws in many instances.

See also Part 1, July, 1900, *In* British Parliamentary Accounts and Papers, vol. 90, 1900.

Molesworth, G. L., "Metric Tables." Spon and Chamberlain, 123 Liberty Street, New York City. 1909. 80c. *Also* E. & F. Spon, Ltd., 57 Haymarket, S. W., London, British Isles. 2s. 6d.

Perkin, F. M., Ph. D., "Metric and British Systems of Weights, Measures, and Coinage." Macmillan Co., 66 5th Avenue, New York City. 1907. 50c. *Also* Whitaker & Co., 2 White Hart Street, Paternoster Square, E. C., London, British Isles. (Economist: "A book which should prove useful to students and commercial men. The tables are very useful, as they enable the reader to see at a glance our various weights and measures and their metrical equivalents.")

Perkin, F. M., Ph. D., "The Metric System." Sir Isaac Pitman & Sons, Ltd., 1 Amen Corner, E. C., London, British Isles. 2s. 6d.

Pèrot, A., "The Decimal Metric System; Foundation; International Organization; Future Development." Typographie Plon Nourrit et Cie, 8, Rue Garancière, 6e. Paris. 1915.

Founders of metrics foresaw development of world trade and ever more imperious demand of world industry.

"Report of Proceedings and Resolutions Adopted at the 57th Annual Meeting of the Association of Chambers of Commerce of the United Kingdom, 20-21 March, 1917," pp. 67-74. (London, British Isles.)

A resolution was carried providing in part "That this Association requests the Executive Council to arrange for the introduction of a Bill to substitute the metric system for the present system of weights and measures and strongly urges His Majesty's Government to pass such a measure during the present session and to bring it into operation at the earliest date convenient to all concerned."

Rosetti, G. A., "Metric English and English Metric Length." Spon & Chamberlain, 123 Liberty Street, New York City. 1913. 30c.

Smith, J. H., "Elementary Treatise on the Metric System of Weights and Measures." Longmans, Green and Co., 443-449 4th Avenue, New York City. 75c.

Sumner, Charles, "The Metric System of Weights and Measures," *In* The Works of Charles Sumner, vol. 10, pp. 524-539. Lee and Sheppard. 1880.

Speech in the Senate on 2 bills and a joint resolution legalizing the metric units, 27 July, 1866. Asks Senate to sanction bills as first practical step for metric standardization.

Turner, Samuel. *See* Gray, H. B. "Eclipse or Empire?"

Woolhouse, W. S. B., "Measures, Weights and Moneys of All Nations." 7th edition. D. Van Nostrand Co., 25 Park Place, New York City. $1.00. (Imported.)

U. S. AMERICAN OFFICIAL DOCUMENTS

1790

Jefferson, Thomas, "Report on Weights, Measures and Coinage," *In* U. S. American 1st Congress, 2d session, Executive Documents, 4 July, 1790.

On the subject of establishing a uniformity in weights, measures and coins. Recommendations for changes in the weights and measures of the United States of America to a decimal system.

Washington, George, "Annual Message to Congress," *In* U. S. American 1st Congress, 2d session, 8 January, 1790.

The President urges the importance of **world uniformity** in the currency, weights and measures of the United States of America.

1791

Washington, George, "Annual Message to Congress," *In* U. S. American 2d Congress, 1st Session, 5 October, 1791.

Calls attention to the necessity of action upon the subject of uniformity in currency, weights and measures.

1795

"Communication from Minister of French Republic," *In* U. S. American 3d Congress, 2d session; 9 January, 1795. (Regarding the adoption by U. S. America of metric weights and measures; detailed description of standards of mensuration, standard of weight, division of the standard into decimal parts.)

1821

Adams, John Quincy, "Report on Weights and Measures," *In* U. S. American 16th Congress, 2d session, Executive Papers, vol. 8, part 109; 22 February, 1821.

"Metric system approaches to the ideal perfection of **uniformity** applied to weights and measures . . . The meter will surround the globe in use as well as in multiplied extension; and one language of weights and measures will be spoken from the equator to the poles." *See* also "Davies" under "Books."

1864

Ruggles, S. B., "International Congress at Berlin," *In* U. S. American 38th Congress, 1st session, House of Representatives, Executive Document 49, 8 March, 1864, 67 pp. (Letter from the Secretary of State transmitting a report of the International Statistical Congress at Berlin. Referred to the Committee on a Uniform Coinage, Weights and Measures, and ordered to be printed.)

Quotes William Ewart, famous British statesman: "To pursue the British system when we could take advantage of a new one is like avoiding a railway to go by the old turnpike road."

"These impediments are so many toll-bars on the highway of education."

"Why should not one uniform system bind countries, as it has bound provinces together?"

Quotes Richard Cobden, pre-eminent British statesman: "Here is a tool that is not merely used by our agricultural laborers in cultivating the land; in every family in the United Kingdom it is in daily use; it offers facilities for saving ½ the time in arithmetical education, and ⅓ or ¼ of the time spent in all the transactions in which you are to make use of this tool; and yet there is a difficulty set up in adopting it."

1866

"Report of Committee on Coinage, Weights and Measures." *In* U. S. American 39th Congress, 1st session, House Report 62; 17 May, 1866. 22 pp.

Upon the general subject of uniform coinage, weights and measures accompanied by bills and resolutions which as acts of Congress were approved 28 July, 1866. Metrics legalized. Metric standardization recommended by the following committee: John A. Kasson, Chairman, Charles H. Winfield, Thomas Williams, Hezekiah S. Bundy, Henry L. Dawes.

(For action in U. S. Senate, see speech of Charles Sumner, in "Congressional Globe," 1866.)

1875

"Memorial to Congress, 17 August, 1875." (In favor of an international bureau of weights and measures. Signed by F. A. P. Barnard, Chairman Committee; J. E. Hilgard, H. A. Newton, J. L. Smith, Joseph Henry, W. B. Rogers, Benjamin Peirce, E. B. Elliott.)

1878

"International Bureau of Weights and Measures," *In* U. S. American 45th Congress, 2d session, House Executive Document 96; 11 June, 1878. (Message from President of the United States of America transmitting a communication from the Secretary of State in response to a resolution of the House of Representatives in relation to the convention for establishing an international bureau of weights and measures.)

1879

"Report of Committee on Coinage, Weights and Measures on the Adoption of the Metric System of Weights and Measures, together with Documents and Statistics Relating to the Subject," *In* U. S. American 46th Congress, 1st session, H. R. 14; Government Printing Office, Superintendent of Documents, Washington, D. C., 1879, 25c, 218 pp.

Recommend exclusive use of metric units.

1880

Culver, C. P., "Report of Committee on Coinage, Weights and Measures on a Decimal System for the English-speaking Nations," *In* U. S. American 46th Congress, 2d session, House Miscellaneous Document 29; 5 March, 1880.

Exclusive use of metric units would secure the 3 grand principles of unity, permanency and universality.

1889

Mendenhall, T. C., "Letter to the Secretary of State, 16 September, 1889," *In* U. S. American Coast and Geodetic Survey Annual Report, 1889. (Transmitting a report upon the subject of weights and measures for the information of the U. S. American delegates to the International American Congress.)

1890

Mendenhall, T. C., "Tables for Converting U. S. American Weights and Measures, Metric and Customary," *In* U. S. American Coast and Geodetic Survey, Office of Standard Weights and Measures, January, 1890, publication; 1900 revision. *Also*, *In* U. S. American Bureau of Standards, 4th edition, Washington Government Printing Office, 1913, Superintendent of Documents, 40c.

"Report of the Committee on Weights and Measures, as Adopted by the International American Conference, 15 January, 1890," *In* U. S. American Coast and Geodetic Survey, Annual Report, 1890.

Tittman, O. H. (Assistant in Charge of the Office of Standard Weights and Measures), "Brief Account of the Weights and Measures in Customary Use in the United States of America with the Legislation Relating Thereto," *In* U. S. American Coast and Geodetic Survey, Annual Report, Note 18, 1890. (Historical account of the U. S. American standards of weights and measures, customary and metric; of the inception and construction of the national prototypes of the meter and kilogram; of their transportation from Paris

to Washington; of their official opening at certification and of their deposit in the Office of Weights and Measures.)

1893

Mendenhall, T. C., "Fundamental Standards of Length and Mass," *In* U. S. American Coast and Geodetic Survey, Annual Report, Bulletin 26, Note 6, 1893.

Mendenhall, T. C., "Units of Electrical Measure," *In* U. S. American Coast and Geodetic Survey, Annual Report, Bulletin 30, Note 7, 1893.

1896

Stone, C. W., "Report from Committee on Coinage, Weights and Measures," *In* U. S. American 54th Congress, 1st session, H. R. 795, vol. 3; 16 March, 1896, 21 pp.

Recommend exclusive use of metric units.

1897

Foerster, W. (Former Chief of the German Bureau of Weights and Measures, and President of the International Committee of Weights and Measures), "Introduction of the Metric System into Germany," *In* U. S. American 54th Congress, 2d session, H. R. 2885, 1897, pp. 12, 13.

Stone, C. W., "Report from Committee on Coinage, Weights and Measures," *In* U. S. American 54th Congress, 2d session, H. R. 2885, vol. 3; 10 February, 1897, 40 pp.

Recommend exclusive use of metric units.

1898

Stone, C. W., "Report of Committee on Coinage, Weights and Measures," *In* U. S. 55th Congress, 2d session, H. R. 1597; 20 June, 1898.

"Your committee believe that the adoption of the metric system of weights and measures would be an advantage and stimulus to our foreign commerce as well as a saving in time and labor in all the affairs of our domestic life, and they therefore **recommend the passage of the bill.**"

1901

"**Memorializing Congress** to Adopt the Weights and Measures of the Metric System as the Standard Weights and Measures of the United States," *In* Congressional Record, U. S. American 57th Congress, 1st session, vol. 35, part 1; 9 December, 1901, p. 209.

"To the Honorable, the Senate and House of Representatives of the United States in Congress assembled: Your memorialists, the Governor and the Legislature of the State of **Utah**, most respectfully represent that inasmuch as the metric system of weights and measurement has been adopted by

a majority of all the enlightened nations and the use thereof is becoming universal, therefore we are heartily in favor of H. R. 5768, introduced by Mr. Shaffroth, and respectfully petition your Honorable Body for the early enactment of such a law."

Southard, J. H., "Report from Committee on Coinage, Weights and Measures," *In* U. S. American 56th Congress, 2d session, House Report 3005, vol. 3, serial 4214; 1 March, 1901, 9 pp. (Gives partial bibliography of U. S. American official documents on weights and measures from 1790-1890.)

Recommend exclusive use of metric units.

1902

Southard, J. H., "Report from Committee on Coinage, Weights, and Measures," *In* U. S. American 57th Congress, 1st session, House Report 1701, vol. 6, serial 4404; 21 April, 1902, 10 pp.

Recommend exclusive use of metric units.

1904

"Laws Concerning the Weights and Measures of the United States of America. An Official Compilation of Legislation on this Subject, by U. S. American Bureau of Standards," Washington Government Printing Office, Superintendent of Documents, Washington, D. C., 1904.

1904-1906

"The Metric System. Hearings before the Committee on Coinage, Weights and Measures, 1904-1906." Superintendent of Documents, Washington, D. C., 15c, 320 pp.

1906

"The International Metric System of Weights and Measures," U. S. American Bureau of Standards, Washington Government Printing Office, 1906, Superintendent of Documents, Washington, D. C., 10c.

"The Metric System. Hearings before the Committee on Coinage, Weights and Measures," *In* U. S. American 58th Congress, 1st session, H. R. 93; *and* U. S. American 58th Congress, 2d session, H. R. 2054, Washington Government Printing Office, Superintendent of Documents, Washington, D. C., 1906, 15c.

Alexander Graham Bell:

"We must either adopt the metrical system or some other system—not our own—which may have some chance of international adoption . . . I do not think any system of weights and measures has any chance of becoming universal except the metric system."

1907

"The Metric System. Hearings before the Committee on Coinage, Weights and Measures," *In* U. S. American 59th Congress, 1st session, H. R. 8988, Washington Government Printing Office, Superintendent of Documents, Washington, D. C., 1907.

W. L. Abbott, Chief Operating Engineer, Chicago Edison Company: "I think I can truthfully say that the majority of the engineers of the country would like to see the metric system adopted, not only in the departments of the Government but in everyday commercial use as well."

1911

Pan-American Commercial Conference Proceedings, Washington, D. C., 13-17 February, 1911, pp. 55, 118.

Mr. Lewis Nixon, U. S. American delegate, expert on shipping: "We are blest here with a decimal system of currency, but still adhere to an antiquated and cumbersome system of weights and measures. Put yourself, for an example, in the place of some man without tables handy who wants a tank to hold so many liters and who struggles with calculations involving inches and feet and gallons, and finally ends by buying from some nation using an intelligent system in the units of which he can think. We should begin to think and deal in everyday life in metric units."

1915

Pan-American Financial Conference, 1st Proceedings, 24-29 May, 1915, Washington Government Printing Office, 1915. *See* pp. 455, 623, 683.

Uruguay Group Conference Report:

"Weights and measures in the American countries should be uniform. The metrical system should be adopted and until this has been done prices, invoices, and bills of lading should be compiled in metrical units."

Memorandum 1 by Republic of Salvador:

"Weights and measures being one of the indispensable factors of commerce it is natural that if the contracting parties have the same simple and practical system, it facilitates their calculations and transactions. The metric system is the simplest and most scientific for all calculations; its adoption by all the nations of America would mean a great step toward commercial intimacy."

1916

Stratton, S. W., "Metric System and Export Trade. Report to the International High Commission Relative to the use of the Metric System in Export Trade," *In* 64th Congress, 1st session, Senate Document 241, Washington Government Printing Office, Superintendent of Documents, Washington, D. C., 1916, 10c.

"In addition to great incidental advantages in the use of the World Metric Units, such as easier selling, greater satisfaction to buyers, and proximate profits, there are more far-reaching gains which can not be over-

estimated. Above all, the effects upon the comity of nations in having a common language of measurement will be to add one more bond of mutual understanding to the forces tending toward permanent world peace."

1917

"Conferences on Weights and Measures of the United States," *In* Weights and Measures Annual, U. S. American Bureau of Standards, Superintendent of Documents, Washington, D. C., 15c. *See* Johnson, G., and Hartigan, J., "Report of the Committee on Resolutions Endorsing the Metric System," *In* Weights and Measures: 11th Annual Conference of Representatives from Various States, 1917, pp. 178-180, 184-192.

North, S. N. D., "Standardization of Census and Commercial Statistics in the American Republics." Washington Government Printing Office, 1917.

Urges metric standardization in a brilliant address before the subsection "Commerce" of Section 9 of the 2d Pan-American Congress, Washington, D. C., 4 January, 1916.

"Units of Weight and Measure; Definitions and Tables of Equivalents," Department of Commerce, Circular of the Bureau of Standards 47, Washington Government Printing Office, Superintendent of Documents, Washington, D. C., 1917, 15c.

1918

Crowell, Benedict (Director of U. S. America's munitions during World War), "America's Munitions," U. S. American War Department, 1917-1918 Report, Washington Government Printing Office, 1919. *See* especially pp. 26, 62, 65, 69, 156, 481, 497, 504.

Shows difficulties arising during world war from lack of metric standardization. Weeks and months spent in changing drawings and converting dimensions affecting manufacture of essential war materials. Lack of metric standardization caused difficulty in replacing spare parts; caused waste in valuable transportation space.

Metric Manual for Soldiers, U. S. American Department of Commerce, Bureau of Standards, Miscellaneous Publication 21, Superintendent of Documents, Washington, D. C., 16 pp.

War Department early in the war found it necessary to adopt metrics for use in France. But this was not the sole reason for publication of the pamphlet. Recognized growth and merits of World Metric Units especially in science and commerce.

"Metric System Use Advised by International Commission," *In* U. S. American Official Bulletin, vol. 2, p. 6; 12 November, 1918.

1919

Kunz, G. F. (President of the American Metric Association), *In* Report of the 2d Pan-American Conference, 2-6 June, 1919, Washington, D. C., pp. 266-270.

"To escape from this 'Confusion worse confounded' into the simple, logical atmosphere of the meter for length, the liter for capacity, and the gram for weight, would be like leaving Purgatory—or a worse place—for the Elysian Fields." *See* also "Kunz" under "Books, American Metric Association."

1921-1922

"**Metric System:** Hearings on S. 2267, A Bill to Fix the Metric System of Weights and Measures as the Single Standard of Weights and Measures for Certain Uses." Government Printing Office, Washington, D. C.

Testimony of more than 50 experts favoring metric standardization in merchandising, as contemplated in the Britten-Ladd Bill.

See especially Parts 1 and 2, and arguments presented in Rebuttal of opposition claims (Part 4.) An abstract of some of the best testimony is contained in the present volume, Chapter 8, "Metric Legislation Before Congress."

U. S. AMERICAN TRADE REPORTS

Baehr, M. J. (Consul, Cienfuegos, Cuba), "Articles Sold by Metric System—Mercantile Ratings," *In* U. S. American Consular Reports, Annual series, numbers 1-8, p. 17, 1908.

Metric system exclusive and adhered to in all official acts.

Benedict, J. S. (Consul, St. Johns, Newfoundland), "Uniform Weights and Measures in Newfoundland," *In* U. S. Daily Consular Reports, vol. 16, numbers 75-151, p. 556, April to June, 1913.

U. S. American 100-weight 12 pounds less than British. Often purchasers buy an underweight package thinking they are getting full weight.

Betts, E. (Vice-Consul General, Bogota, Colombia), "Hints to Exporters," *In* U. S. American Consular Reports, number 341, p. 25, January to March, 1909.

The invoices, package lists and package marks of shipment for Latin America should invariably be made using the gram as the unit of weight.

Blom (Vice and Deputy Consul, Copenhagen), "Metric System in Denmark," *In* U. S. American Consular Reports, vol. 59, numbers 220-223, p. 147, January to April, 1899.

Boyle, J. (Consul, Liverpool, England), "British Weights and Measures," *In* U. S. American Consular Reports, numbers 292-297, pp. 143-146, January to June, 1905.

List given to demonstrate confusion in some of the bewildering and anomalous weights and measures of Britannia.

Brickwood (Vice-Consul, Sonora, Mexico), "The Republic of Mexico—Metric System," *In* U. S. American Consular Reports, numbers 304-306, p. 79, January to March, 1906.

"British-Argentine Chamber of Commerce Report, Abstract of Article in Weekly Bulletin, Canadian Department of Trade and Commerce, Ottawa," *In* U. S. American Commerce Reports, vol. 21, number 1, p. 391, January to March, 1918.

British Chamber of Commerce in Argentina sends memorial to British Prime Minister advocating adoption of metrics.

"British Banker Advocates Metric System" (Sir Edward H. Holden, Chairman of London City and Midland Bank, Ltd.), *In* U. S. American Commerce Reports, vol. 20, number 1, p. 930, January to March, 1917.

"It appears to me that if we are seeking—as we are—to extend our trade to those countries where German influence has hitherto predominated we must at once begin to adopt the systems which are most easily comprehended by purchasers."

"British Publication Advocates Decimal Coinage (The Economist, London, British Isles)," *In* U. S. American Commerce Reports, vol. 20, number 1, p. 1048, January to March, 1917.

Decimal coinage convenient in banking and account-keeping. If British adopt decimal coinage, surviving opposition to introduction of metrics would disappear. Almost universal agreement that use of metrics would expand British trade.

Clark, L. B., "Wearing Apparel in Argentina," *In* U. S. American Department of Commerce, Bureau of Foreign Commerce, Miscellaneous Series number 68, p. 35, 1918.

Argentina has adopted the metric weights and measures. Sizes of collars, shirts, shoes, and so on, are always figured in centimeters, and the ultimate consumer rarely knows of any other way of requesting his size.

"Consular Agency Report (Roubaix, France)," *In* Commercial Relations of U. S. America, vol. 2, p. 232, 1901.

Greater attention is given to circulars and price lists that give the quotations in French currency and employ the metric weights and measures.

Dawson, W. (Consul, Montevideo, Uruguay), "Use of the Metric system in Uruguay," *In* U. S. American Commerce Reports, vol. 21, number 3, p. 786, July to September, 1918.

Metrics exclusively used in Uruguay.

"Decimal System Advocated for British Empire," *In* U. S. American Commerce Reports, vol. 19, number 4, p. 218, October to December, 1916.

British Imperial Council of Commerce adopts resolution favoring metrics.

Dunlap, M. P. (Consul, Stavanger, Norway), "Metric System in Norway," *In* U. S. American Commerce Reports, vol. 20, number 2, April to June, 1917.

"Weight system hinders sale of U. S. American drugs and chemicals in Norway. Dealers would rather buy in uncertain markets where prices may be even higher than to learn our complicated weights."

Eustis, J. B. (Ambassador, Paris), "Paris Conference on Weights and Measures," *In* U. S. American Consular Reports, vol. 49, numbers 180-183, p. 353, September to December, 1895.

Evans, H. C. (Consul-General, London), "Metric System in Great Britain," *In* U. S. American Consular Reports, vol. 70, numbers 264-267, p. 331, September to December, 1902.

Letter from Decimal Association showing wide-spread demand for metrics. Premier Balfour:

"There can be no doubt whatever that the judgment of the whole civilized world, not excluding the countries which still adhere to the antiquated systems under which we suffer, has long decided that the metric system is the only rational system."

Fechet, E. O. (Consul, Piedras Negras), "Mexican Trade and How to Secure It—Weights and Measures," *In* U. S. American Consular Reports, vol. 40, numbers 144-147, p. 389, September to December, 1892.

Gilbert, W. (Consul, Liege), "Metric Congress at Paris in 1900," *In* U. S. American Consular Reports, vol. 57, numbers 212-215, p. 545, May to August, 1898.

Gottschalk, A. L. M. (Consul General, Rio de Janeiro), "Systems of Measurement in Brazil," *In* U. S. American Commerce Reports, vol. 20, number 1, p. 500, January to March, 1917.

"Brazilians are unfavorably impressed when they receive correspondence in which references are made to feet, yards, and miles, instead of the meters and kilometers to which they are accustomed."

Halstead, M. (Consul, Birmingham), "Metric System in Great Britain: Bills of Lading," *In* U. S. American Consular Reports, vol. 70, numbers 264-267, p. 251.

Hanauer (Vice-Consul-General, Frankfort), "The Metric System in Russia," *In* U. S. American Consular Reports, vol. 64, numbers 240-243, p. 544, September to December, 1900.

Haskell, L. W. (Consul, Geneva, Switzerland), "Advantages of the Metric System," *In* U. S. American Commerce Reports, vol. 21, number 2, p. 391, April to June, 1918.

"It has been ascertained that a Swiss purchaser of iron sheets of 3, 5, and 7 millimeters in thickness, was informed by a British manufacturer that it would be impossible to furnish sheets of the thickness given in millimeters, as these sheets were made according to the fractions of an inch. American manufacturers will do well to take note of this item."

Hayes (Consul, Rouen), "The Metric System—20 Countries where Compulsory," *In* U. S. American Consular Reports, vol. 67, numbers 252-255, p. 453, September to December, 1901.

Henry, F. A. (Consul, Puerto Cabello), "Weights and Measures in Venezuela," *In* U. S. American Commerce Reports, vol. 21, part 1, p. 1214, January to March, 1918.

"It is generally agreed here that the compulsory adoption of the metric system was a wise measure and that its use has simplified and facilitated the transaction of business."

Hill (Consul, Amsterdam), "The Metric System in Foreign Trade," *In* U. S. American Consular Reports, vol. 67, numbers 252-255, p. 565, September to December, 1901.

Necessary for U. S. American manufacturers to adopt metrics in world trade. Firm in Holland received cable offer from New York City for 2,000 barrels of potatoes. Whole day lost before could find out how many pounds in U. S. American barrel. Had the offer been made in kilograms, every business man in the commercial world from Vladivostok to Mauritius would have understood it instantly.

Hitch, C. M. (Consul, Nottingham, England), "British Sentiment for Metrics," *In* U. S. American Commerce Reports, vol. 20, number 2, April to June, 1917.

British sentiment favors decimal coinage as preliminary step to the adoption of metrics.

Honey, R. (Consul, Madrid, Spain), "Use of word 'Inches' in Madrid District," *In* U. S. American Commerce Reports, vol. 18, number 4, p. 217, October to December, 1915.

Metric system is standard. No confusion will result from its employment.

"Industry and Finance in the Orient," *In* U. S. American Commerce Reports, vol. 19, number 1, p. 587, January to March, 1916.

Metrics used in China.

Ingram, A. E. (Consul, Bradford, England), "Variations of Measures Hinders Trade," *In* U. S. American Daily Consular and Trade Reports, vol. 2, numbers 76-152, p. 284, October to December, 1910.

Standard gallon of U. S. America contains but 8.3 pounds avoirdupois, while the British gallon contains 10 pounds. Engineers and others in various parts of the world who order U. S. American pumps or other machinery supposing the capacity to be stated in the gallons in use by them are liable to be unfavorably prejudiced against the American article. Difference would cause considerable disturbance in estimates, calculations, and so on.

"The International High Commission Favors Use of Metric System," *In* U. S. American Commerce Reports, vol. 21, number 4, p. 628, October to December, 1919.

"Those who read the Commerce Reports of the United States Department of Commerce know how numerous are the opportunities necessarily allowed to pass by because of our inability to supply goods and machinery constructed in accordance with the metric system."

Kaiser, L. (Consul, Mazatlan, Mexico), "Metric Units in Mexico," *In* Commercial Relations of the United States, vol. 1, p. 473, 1901.

"U. S. American manufacturers and exporters could greatly increase their trade if they would employ the metric system of weights and measures."

Le Roy, J. A., "Metric System in Mexico," *In* U. S. American Monthly Consular Reports, vol. 75, number 284, pp. 391, 392, May, 1904.

McFarland (Consul, Nottingham), "Counts of Yarn by the Metric System," *In* U. S. American Consular Reports, vol. 63, numbers 236-239, p. 386, May to August, 1900.

McLean, A. (Consul, Puerta Plata), "Weights and Measures of the Dominican Republic," *In* U. S. American Commerce Reports, vol. 21, part 1, p. 1215, January to March, 1918.

"All weights and measurements of merchandise shipped to the Dominican Republic should be declared in the metric system in the consular invoice, as that is a customs requirement."

Mason, B. (Vice and Deputy Consul-General, Berlin), "Metric Weights and Measures in Germany," *In* U. S. American Consular Reports, vol. 71, numbers 268-271, p. 374, January to April, 1903.

"Metric Classification of German Iron Manufactures," *In* U. S. American Consular Reports, vol. 62, p. 337, January to April, 1900.

"I may instance as an undoubted fact that the preference which Germany has obtained here over Great Britain as regards railroad bridges and other railroad material is mainly owing to the existence of this metric classification. And as regards tubes and pipes for waterworks, it is absolutely certain that the Dutch market is completely lost to Great Britain as far as any new constructions are concerned for the same cause."

"Metric System and Trade," *In* U. S. American Consular Reports, vol. 75, numbers 283-285, pp. 384-389, April to June, 1904.

Two-thirds of a school year saved by adopting metrics. Carry this enormous saving of time into the counting houses of the country, into all kinds of calculations from the farm to the factory, and a fairly good idea is obtained of what the metric units would save.

"Metric System a Necessity in Latin-American Trade," *In* U. S. American Commerce Reports, number 93, pp. 473-477; 21 April, 1919.

"Metric System as Used in Western Hemisphere," *In* U. S. American Department of Commerce, Special Agent Series 109-214, pp. 81, 116, 135, 162; *and* Series 141-149. (Short statements giving extent to which metrics used.)

"Metric System: Greatly Increased Use by U. S. American Manufacturers. War Department has Big Demand for Metric Literature," *In* U. S. American Department of Commerce, Annual Report, pp. 506, 507, 1917.

"Metric System in Denmark," *In* U. S. American Consular Reports, numbers 328-330, p. 250, January to March, 1908.

"Metric System in Tunis," *In* U. S. American Consular Reports, vol. 47, numbers 172-175, p. 455, January to April, 1895.

"The Metric System Legalized in Great Britain," *In* U. S. American Consular Reports, vol. 56, numbers 208-211, p. 595, January to April, 1898.

"Metric Weights and Measures in Germany," *In* U. S. American Consular Reports, number 1548, 19 January, 1903.

Report of the ease with which metric units were installed and put into exclusive use in Germany.

Monaghan (Consul, Chemnitz), "The Metric System in Germany," *In* U. S. American Consular Reports, vol. 55, numbers 204-207, p. 460, September to December, 1897.

No one can find fault with the effort to substitute metrics for the yard and pound. The simplicity of the system, the rapidity with which it can be divided or multiplied, make it friends among merchants and manufacturers.

Montavon, W. F. (Commercial Attaché, Lima, Peru), "Metric Units in Peru," *In* U. S. American Commerce Reports, vol. 19, number 4, p. 244, October to December, 1916.

"American manufacturers desiring to enter this market should use the metric system."

"Pharmacopoeia Adopts Metric System," *In* U. S. American Commerce Reports, vol. 19, number 1, p. 1208, January to March, 1916.

Makes use of metrics exclusively.

"Present Opportunity for Extending Metric System," *In* U. S. American Commerce Reports, vol. 20, number 1, p. 1087, January to March, 1917.

Vast powers of which government is in possession may facilitate adoption of metrics.

"Proposed Weights and Measures Reform in Great Britain" (from the British Trade Journal, London, 1 September, 1904), *In* U. S. American Consular Reports, numbers 286-291, p. 91, July to December, 1904.

It may be taken as an axiom regarding the equivalents between British weights and measures and metric units that unless a buyer is very acute he will get the worst of the bargain when the change is made. Prejudices purchasers against British and U. S. American goods.

"Proposes Metric System for Great Britain," *In* U. S. American Commerce Reports, vol. 19, number 2, p. 146, April to June, 1916.

From office of American commercial attaché, Paris, France: Adoption of metrics would sacrifice nothing except complicated weights and measures.

Redfield, W. C., "The Metric System as a Help to Post-War Trade," Address before the American Metric Association, Baltimore, 27 December, 1918, *In* U. S. American Commerce Reports, vol. 22, part 1, numbers 1 to 75, pp. 913-919, January to March, 1919.

"Germany built up her trade in a painstaking way. Observe that the fundamental feature was adapting the goods to the desires of the local community."

Also, Published as a separate pamphlet by the American Metric Association, 156 5th Avenue, New York. *Also,* Published in Book 3, "Metric Units to Unite the World," by World Trade Club, San Francisco. (See Chapter 13, this volume.)

Reinsch, P. S. (Recent American Minister, Peking, China), "China's New Weights and Measures Law," *In* U. S. American Commerce Reports, vol. 18, number 2, p. 382, April to June, 1915.

Recently promulgated weights and measures law of China establishes standard metric unit.

Robinson, A. C. (Commercial Agent of the Department of Commerce and Labor), "Cuba as a Buyer and Seller," *In* U. S. American Department of Commerce and Labor, Bureau of Foreign and Domestic Commerce, Special Agents Series, number 61, p. 31.

Pounds, gallons and yards unfamiliar to Cubans. Should use metrics in dealings with this country.

Sawter (Consul, Glaschau), "American Products in Bradford," *In* U. S. American Consular Reports, vol. 52, numbers 192, 195, p. 594, September to December, 1896.

Not only are U. S. American price lists confusing to foreign merchants, but foreign lists are made in terms equally unfamiliar to American merchants. Often results in unfair discrimination and fraud. Metric standardization the remedy.

Skinner, Robert P., (Marseilles), "American Trade with France—Metric System Annual Report," *In* U. S. American Consular Reports, vol. 68, number 256-259, p. 90, January to April, 1902.

Naval collier "Scindia," boiler tubes burnt out at Marseilles. Cable to U. S. America for material. Ship was delayed 2 or 3 weeks in consequence of the fact that her boilers had been built upon a scale of feet and inches, while European tubing was manufactured according to metric units.

Also, In Commercial Relations of U. S. America, vol. 2, p. 210, 1901. (Since 1914, Mr. Skinner has been U. S. Consul-General at London, British Isles.)

Smith, S. (Consul, Ensenada, Lower California, Mexico), "Uruguay Requires Use of Metric Units," *In* U. S. American Commerce Reports, vol. 21, number 2, p. 107, April to June, 1918.

Smith, U. G. (American Minister, Brussels), "Belgian Government Adopts Metric System," *In* U. S. American Daily Consular and Trade Reports, vol. 2, number 76-152, p. 424, October to December, 1910.

Stuart (Minister, Montevideo), "Metric System in Paraguay and Uruguay," *In* U. S. American Consular Reports, vol. 55, numbers 204-207, p. 308, September to December, 1897.

Thackara, A. M. (Consul, Havre, France), "United States Trade with France—Metric System," *In* U. S. American Consular Reports, vol. 71, numbers 268-271, p. 413, January to April, 1903.

The sooner U. S. American exporters learn to use metrics the better chance they will have of successfully meeting world competition in the French markets. Gives example of inferior Austrian oak commanding a higher price and being used in preference to superior American oak because French want wood sawed to metric dimensions.

Also, In Commercial Relations of U. S. America, vol. 2, p. 173, 1902.

Turner, J. M., "Trade Development in Latin America," *In* U. S. American Department of Commerce and Labor, Bureau of Manufactures, Special Agent Series, number 45, p. 32, 1911.

European styles are followed and European goods are much better known, because the sizes, weights, and generally the prices are in the metric units.

Voetter, T. W. (Consul, Antofagasta, Chile), "Metric and Other Systems in Chile," *In* U. S. American Commerce Reports, vol. 20, number 1, p. 804, January to March, 1917.

Work for government done according to metric measures.

Walker (Consul-General, Paris), "A World Bureau of Weights and Measures in France," *In* U. S. American Consular Reports, vol. 2, number 4, p. 581, February, 1881.

"**War Department Adopts Metric System** for Maps and Gun Firing Data. Bureau of Standards Issues Metric Manual," *In* U. S. American Department of Commerce, Annual Report, p. 87, 1918.

Warner, Jr., B. H. (Consul, Leipzig, Germany), "Industrial and Trade Statistics—Metric System for Great Britain," *In* U. S. American Consular Reports, vol. 74, numbers 280-282, p. 446, January to March, 1904.

Wiley, S. H. (Consul, Asuncion, Paraguay), "Weights and Measures—Marking Credits," *In* U. S. American Commerce Reports, vol. 18, number 2, p. 818, April to June, 1915.

Metric units used exclusively in Paraguay. Merchants say that feet, pounds, etc., are unintelligible to them.

Wilson, T. (Consul, Nice, France), "The Metric System of Weights and Measures—Merits of the Various Standards," *In* U. S. American Consular Reports, vol. 16, numbers 53-56, pp. 412-414, June to September, 1885.

"If any recommendation of mine should quicken its introduction into the United States I should feel amply repaid for my labor in this behalf."

BRITISH PARLIAMENTARY REPORTS, ACCOUNTS AND PAPERS

In British official reports it is set forth that, in 1782, William Pitt, British Premier, got passed a law prohibiting further use of the Tally in the English Exchequer (Treasury), and use of 1234567890 instead of the Roman numerals. In 1835 the "Tallies" accumulated in the Exchequer were burned, by order of the government, in the stoves of the House of Lords—a proceeding that caused the destruction of the Houses of Parliament by fire.

In 1783, James Watt wrote 20 worker-friends plans for world decimal units (which became the metric units—dollar, meter, liter, gram) and got them into world use.

1814. Report of committee on the original standards of weights and measures and on the most effectual means for ascertaining and

enforcing uniform and certain standards to be used in the future. Evidence and notes.

1819-1821. 3 reports of commissioners appointed to consider the need for establishing uniform weights and measures.

1821. Report of committee to consider the above reports.

1823. Report of Committee on Weights and Measures. Evidence and notes.

1834. Report of Committee on Weights and Measures. Evidence and notes.

1835. Report of Committee on Weights and Measures. Evidence presented showing need for metric uniformity.

1862. Vol. 7, 274 pp. Report of select committee urging adoption of simple and uniform weights and measures:

"Your committee have examined men of science, merchants, manufacturers, and working men belonging to the British Isles. They have sought for advocates of the existing weights and measures, but they have found it difficult to discover them."

Testimony given by 40 witnesses. Opinions of world experts presented. Letters and other evidence adduced urging adoption of metric units. Index giving summary of evidence together with analysis of index. Report of committee presents digest of evidence in 7 pages. Especially convincing testimony showing need for **world standardization** given by the following: Charles William Siemens, Esq., C. E., F. R. S.; M. Michel Chevalier, French Councillor of State, Member of the Institute; M. Auguste Visschers, member of Belgian Board of Mines and of Belgian Central Statistical Commission.

(This monumental report is reprinted as Chapter 12 of the present volume.)

1864. Vol. 58. Report of World Statistical Congress, Berlin, 1863. Recommend metric as most convenient of all units.

"Unity of money, weights and measures are the most important auxiliaries for comparative statistics."

Tabulated answers to questionnaire giving causes of advance to metrics and beneficial results in world relations.

Letter from Comptroller-General with report on Exchequer standards. Good material for chronology on weights and measures.

Statement by James Yates, F. R. S., on behalf of the world association for obtaining uniform weights and measures. Urges metric standardization.

1867-1868. Vol. 27, supp. Report of World Conference on Uniform Weights and Measures, Paris, June, 1867. Commissioners

urge metric standardization. Point out widespread adoption. Show advantages, especially in science and commercial transactions. Application easy in industry, mechanics and construction.

1868-1869. Lords, vol. 36. Report of commission on Exchequer standards. Urge uniformity.

1868-1873. 5 reports of British Royal Commission on the condition of the Exchequer. Evidence and notes urging metric standardization.

1900. Vol. 90. Reports on the experience of nations which have adopted metrics. Europe and Asia Minor.

1901. Vol. 80. Reports on the experience of nations which have adopted metrics. Latin America and Asia.

1904. Discussion on metrics in Hansards' Parliamentary Debates, 23 February, 1904.

Report of Parliamentary Committee on Weights, Measures and Coinage, **urging metric standardization, 1904.**

PERIODICAL PUBLICATIONS

A

"Abstract of Report Given by Consul Boyle of Liverpool Showing Great Saving from Decimalizing One Unit—the Half-Hundredweight," *In* Science, vol. 19, pp. 119, 120; 15 January, 1904.

"Accuracy and Uniformity in Electrical Standards," *In* Scientific American, vol. 99, p. 330; 14 November, 1908.

Spirit of international co-operation manifest in past. Measures proposed leading to greater uniformity.

Adams, C. A., "Engineering and Industrial Standardization," *In* Journal of Electricity, vol. 43, pp. 411, 412; 1 November, 1919.

Shows need for standardization. Rating of machinery revised on rational basis. Has done much to make competition equitable and satisfactory for the United States of America. (See page 215, this volume.)

"Adoption of the Metric System," *In* Nature, vol. 99, pp. 526, 527; 30 August, 1917.

"Not British vs. metric system, for there is no British system. In certain industries, from the day that the metric system was adopted there would be a credit side to the account."

"Adoption of the Metric System," *In* Nature, vol. 100, pp. 467, 468; 14 February, 1918.

Risk of standing still far greater than risk incident upon exclusive adoption of the metric units. Do it now.

"Advance of the Metric System," *In* The Valve World, vol. 16, p. 30; January, 1919.

Uniformity in classifying merchandise will require thoro and complete adherence to the metric units.

Allcock, H., "British Decimal Coinage," *In* Production, October, 1919.

Allcock, H., "British Decimal Coinage and the International Metric System of Weights and Measures," *In* Junior Institution of Engineers Journal, June, 1919.

Allcock, H., "Decimal Coinage," *In* Federation of British Industries Bulletin, 24 November, 1919.

Allcock, H., "The Decimal System a Necessity for Great Britain," *In* The Beama Journal, October, 1918.

Allcock, H., "The Decimal System of Coinage, Weights and Measures," *In* Surveyor and Municipal and County Engineer (London), vol. 51, pp. 388, 389; 20 April, 1917, and vol. 51, pp. 415, 416; 27 April, 1917.

"He would indeed be a bold man who would undertake the mission of converting a metric country to the use of the British system."

Allcock, H., "Industrial Reconstruction and the Metric System," *In* Electrical Review (London), vol. 84, p. 79; 17 January, 1919.

The present chaos of weights and measures causes waste of time and confusion of thot. By basing all new developments on metric units, manufacturers would help themselves as well as the people.

See also "Allcock" under "Books. London Decimal Association." *Also, In* Federation of British Industries Bulletin, 13 February, 1919.

Allcock, H., "International Metric System: A Plea for Government Action," *In* Federation of British Industries Bulletin, 13 February, 1919.

Allcock, H., "International Trade and the Metric System," *In* Association of Great Britain and France Journal, vol. 1, pp. 67-71; July, 1919.

"Manufacturers and traders in non-metric countries have for long been compelled to employ the metric units in a constantly increasing portion of their business so that they now find themselves confronted with the alternatives of either wasting more and more time on conversions from and to the metric units or of demanding that all their commercial contracts shall henceforth be expressed solely in terms of the metric units. To continue their present practice involves the use of 2 systems where one would suffice for all purposes, and they can no longer avoid the use of the metric system even if they would."

Allcock, H., "Metric System and Decimal Coinage," *In* Nature, vol. 101, pp. 274-277; 6 June, 1918.

Unwarranted assumption that adoption of metric units would necessarily involve altered dimensions of machine parts. Inches and parts thereof can be readily expressed in millimeters and parts thereof.

Allcock, H., "The Metric System," *In* Surveyor, vol. 54, p. 227; 8 November, 1918.

We already find ourselves obliged to use the metric system to an ever-increasing extent in scientific work, in manufacture and in export trade, and the retention of our complicated system thus handicaps us by compelling us to employ 2 systems where one would be infinitely better in every way.

Allcock, H., "The Metric System and International Trade," *In* Nature, vol. 106, pp. 169-170; 7 October, 1920.

"American Institute of Electrical Engineers Passes Resolution Favoring Introduction of Metrics," *In* Science, vol. 23, p. 755; 11 May, 1906.

"American Metric Association Meeting, 1918, Baltimore," *In* Science, vol. 49, pp. 291, 292; 21 March, 1919.

Summary of proceedings at second annual meeting. Addresses favoring metrics by engineers Molitor, Mailloux, and J. M. Smith, Professor Bingham, Senator Shafroth, and Secretary Redfield.

"America's Demand for a Fair Measure Deal," *In* Grip, pp. 11-16; October, 1920.

It is urged that the world metric language of meter-liter-gram replace the present babel of weights and measures. "The next logical step is for Congress to abolish all our antiquated systems and make the metric the only one to be used legally."

Anthony, E., "Metric System," *In* Westminster Review, vol. 163, pp. 139-147; February, 1905.

It is an error to believe that metric standardization is a matter for experts alone. Decimal system is simple and requires only a primary knowledge of mathematics.

Arny, H. V., Ph. D., "The Metric System in Every-day Life," *In* Scientific Monthly, vol. 4, pp. 202-206; March, 1917.

"A simple story of my own experiences with that beautiful, logical and simple system of weights and measures now used by 437,000,000 of the people of this globe."

Atkinson, B., "The Metric System," *In* Institution of Electrical Engineers of Great Britain Journal, vol. 56, pp. 121-128; February, 1918. (Outlines practical program for adoption. Gives chronology of metric progress in Britannia.)

B

Bailey, R. C., "The Adoption of the Metric System," *In* Professional Engineer, p. 20; January, 1921.

"The adoption of this system would be a big step towards efficiency, since it will facilitate calculations."

Barnard, F. A. P., "The Metric System," *In* Knowledge, vol. 5, pp. 457-458; 20 June, 1884.

"A system which has already been so widely accepted as a means of regulating the ordinary transactions of business between man and man in everyday life, and which is involved in the greater part of the international commerce of the human race, must sooner or later be universally prevalent."

Barnard, F. A. P., "The Metric System," *In* University of New York State Regents' Reports, vol. 85, pp. 584-691; 1872.

"The world must have a common system of weights and measures. The choice must lie between our own and the metric. All causes unite to render the ultimate triumph of metrics inevitable."

Barnet, S., "Metric Advance," *In* Popular Science Monthly, vol. 13, pp. 82-92; May to October, 1878.

"The ultimate triumph of the metric system may be regarded as safe, beyond peradventure; no event still in the future is more certain."

Bell, Alexander Graham, "Our Heterogeneous System of Weights and Measures," *In* National Geographic Magazine, vol. 17, p. 158; March, 1906.

By adoption of metric units world commerce of the United States of America would be helped tremendously. Change would not involve new tools in workshops. It is a question of arithmetical calculation, not of tools or machinery.

Also, Published as separate pamphlet by Press of Judd & Detweiler, Inc., Washington, D. C., 1906.

Benedict, A. L., M. D., "War of the Metric System," *In* New York Medical Journal, vol. 103, pp. 824, 826; 29 April, 1916.

Metrics of incalculable value from peace standpoint. Do much to avert catastrophe in war. Adoption by United States of America would give training in co-operative foresight and initiative to secure efficiency. Every branch of the metric system comes together somewhere with the others; for example, the c. c. and the gram, and the solid and liquid bulk ton.

Berrini, L. C., "South American Plea for the Metric System," *In* Machinery, vol. 25, p. 850; May, 1919.

"Books for Metric Students," *In* The Valve World, vol. 16, p. 23; January, 1919.

Boyer, J., "International Bureau of Weights and Measures; Interview with Charles Edouard Guillaume," *In* Scientific American Monthly, vol. 3, pp. 105-109; February, 1921.

Briggs, E. R., "Metric System," *In* American Machinist, vol. 25, p. 450; 27 March, 1902; and p. 1347; 18 September, 1902.

"If those who oppose the adoption of the metric system would ask themselves common-sense questions and would abide by the logical answers, instead of being 'conscientious objectors,' the opposition to this system would go."

Briggs, E. R., "The Metric System in Mechanical Electrical Engineering," *In* Electrical Engineer (London), vol. 34, pp. 561-563; 14 October, 1904.

Metric units exactly suited to the requirements of the engineer.

"British Association of Chambers of Commerce for an International Agreement on the Metric System," *In* Americas, vol. 3, p. 22; April, 1917. *Also, In* Current Business Cyclopedia, vol. 2, p. 288; April to June, 1917.

"British Weights and Measures and the Metric System," *In* Edinburgh Review, vol. 212, pp. 426-449; October, 1910.

For simplification of arithmetic, all multiples and all subdivisions of units must proceed by tens.

Brooks, C. E., "A Convenient and Graphic Way of Showing Relations Between Units of the International Metric System" (chart), *In* The Valve World, vol. 9, pp. 16, 17; November, 1912.

Brooks, F., "The Folly of Reckoning by Gallons, which differ 20% in Canada and the United States, while all Countries Have Identical Liters and Cubic Meters," *In* New England Water-works Association Journal, vol. 17, p. 258; September, 1903.

Urging the use of metric units in measuring water consumed. Recommends that metric capacity measure be introduced for expression of quantities of water.

Brooks, F., "Metric System in Russia," *In* Valve World, vol. 15, pp. 424-426; December, 1918.

Brown, S., "On the Metric System and its Proposed Adoption in Britain." *In* Society of Arts Journal, vol. 12, pp. 167-170; 29 January, 1864.

If metric system not even so perfect as it is, would be expedient and wise to adopt units common to world, rather than remain isolated and obstructive in a matter where the interests of commerce are much concerned.

"Business Men Who Want the Metric System," *In* Science, vol. 44, p. 59; 14 July, 1916.

Every wholesale grocer is urged to print on the labels of all canned and boxed goods the metric equivalent. American National Wholesale Grocers Association prove gain in world trade follows upon adoption of metric units.

C

Cabot, G. L., "Metric System Should Be Adopted for Aeronautic Purposes," *In* Flying, vol. 6, p. 862; November, 1917.

Metric units make for world efficiency. In connection with aeronautics, metrics greatly simplify work of production and inspection.

Cary, A., "Simple Approximate Metric Conversions," *In* Power, vol. 37, pp. 217-219; 18 February, 1913.

Soon learn to think in metric units without regard to clumsy units commonly used in this country. Aid at first to note surprising number of units about 10% more than those now in use. The meter is the yard plus 10%; the 500 grams is the pound avoirdupois, plus 10%; the liter is 5% more than U. S. American liquid quart and 13% less than British quart.

Also, In The Valve World, vol. 10, pp. 143-146; May, 1913.

"Changing View of 100-weight," *In* The Valve World, vol. 10, p. 169; June, 1913.

British have 2 different 100-weights and 2 different tons. Acceptance of decimal basis would be long stride toward full adoption of world metric units.

Chaundry, T., and Plummer, T. H., "Metric Threads," *In* English Mechanic and World of Science, vol. 109, pp. 172-173; 2 May, 1919.

Rules for cutting metric screw threads on English lathes.

Chisholm, H. W., "The International Metric Commission," *In* Nature, vol. 7, pp. 197,198; 16 January, 1873.

Recognizes great importance of metrics. Gives an accurate world system which, like the Latin of the Middle Ages, enables men to speak the same language.

Chisholm, H. W., "Metric Commission, International, at Paris," *In* Nature, vol. 13, pp. 452-454; 6 April, 1876.

Collins, J. V., "5 Metric Myths," *In* American Machinist, vol. 46, p. 434; 8 March, 1917.

For exclusive use of metrics.

Collins, J. V., "Metric Advance in the United States," *In* Educational Review, vol. 52, pp. 265-271; October, 1916.

Two-thirds of a year of the child's school life wasted in learning the arithmetic made necessary by U. S. American weights and measures. A low estimate places this cost to United States of America at $200,000,000 annually.

Collins, J. V., "Metrical Tragedy," *In* Scientific Monthly, vol. 1, pp. 256-263; December, 1915.

$315,000,000 total annual loss of our present mediaeval lack of system.

Also, In American Journal of Pharmacy, vol. 88, pp. 147-155; April, 1916.

Collins, J. V., "Metric Weights and Measures," *In* Education, vol. 15, pp. 229-235; December, 1894.

Explains metric units. Should be taught in schools so that children would come to learn and like metrics. Confused weights and measures now in use.

"Commissioner of Education Champions Metric System," *In* American Export Monthly, p. 67; 13 November, 1920.

P. P. Claxton, United States Commissioner of Education, urges metric standardization.

"Customs Congress and the Metric System," *In* Iron Age, vol. 72, p. 27; 2 July, 1903.

First Customs Congress of the American Republics, February, 1903, held at New York City under the auspices of United States Government. Vote unanimously favoring metric standardization. Now necessary to spend large sums for translation of equivalents. Metrics would be of great advantage in a practical business way.

D

"Decimal," "The Metric System," *In* Engineering and Mining Journal, vol. 79, p. 383; 23 February, 1905.

Would soon forget that we had ever been so foolish as to use anything but the easiest units.

"Decimal Equivalents and Metric Conversions," *In* Motor Age, vol. 34, p. 44; 7 November, 1918.

"Decimalizing British Measures," *In* American Architect, vol. 2, pp. 305, 306; 22 September, 1877.

Shows superiority of metric units over a decimal system which would retain the antiquated weights and measures.

"Decimal Weights and Measures," *In* Chambers Journal, vol. 17, p. 316; 8 May, 1852.

Should adopt metrics on account of simplicity.

"Discussion on Metric System," *In* Franklin Institute Journal, vol. 153, pp. 401-418; 1902.

Special committee reports favoring exclusive use of metric units.

"A Draftsman's Sane Views," *In* The Valve World, vol. 11, pp. 321, 322; October, 1914.

"We Americans do not realize how we are handicapped. In my business, drafting, I cover a wide range of work—mechanical, structural, and architectural—and I have demonstrated for my own information, that often I could get 8 hours' work done in 7 hours if I could use some practical decimal system, like the International Metric System, instead of having to use the fractional English system."

Drake, F. R., "The Metric System from the Standpoint of the National Wholesale Grocers and the Canning Industry," *In* Scientific Monthly, vol. 4, pp. 206-210, March, 1917.

Give moral and financial support to association for forwarding adoption of the metric units by both educational and legislative means.

See also "Drake" under "Books. American Metric Association."

Drury, Aubrey, "Standardization: Lack of Metric System Handicap to United States in Work of Reconstruction and in Pursuit of World Trade," *In* Current Affairs (Organ of Boston Chamber of Commerce), vol. 10, p. 4; 13 October, 1919.

World War experience proved necessity of adopting metrics.

Drury, Aubrey, "Standardization with Metric Units," *In* Journal of Electricity, vol. 43, pp. 409-411; 1 November, 1919.

Only one real "system" of weights and measures now in use. It is that simple decimal system which employs the three principal metric units: meter-liter-gram.

Drury, Aubrey, "Speech before World Trade Club," 18 June, 1919. *See* under "Books and Pamphlets, World Trade Club." Book 2.

Dunbrack, W. H., "Metric System in Watch Industry," *In* Machinery, vol. 24, pp. 643, 644, 702; March, 1918.

"To one who has never employed the metric system as used in the watch industry, the utility and simplicity of its measurements are equivalent to a lost art—the system **must be used to be appreciated.**"

E

"Economic Phase of the Metric System," *In* Valve World, vol. 14, pp. 100, 101; March, 1917. (Reprinted from Carpenter and Builder, London.)

"Editorial on Metric System," *In* Chambers Journal, vol. 39, p. 19; 10 January, 1863.

Should adopt metric units on account of their simplicity, because they save time and money, and because they will increase Unitannian trade.

"The Effort to Replace the Fahrenheit Thermometer with the Scientific Centigrade Thermometer," *In* Current Opinion, vol. 60, p. 333; May, 1916.

Use Centigrade scale for all purposes to secure uniformity not only with other countries but also between popular and scientific practice in United States of America.

Also, In Electrical World and Engineer (New York), vol. 44, pp. 784-794; 5 November, 1904.

Eliot, C. W., "Metric System of Weights and Measures," *In* Nation, vol. 2, p. 731; 8 June, 1866.

Short history of metric units; tables. Advocates exclusive of metrics on account of simplicity and universality.

F

Fawcett, Waldon, "Standardization." *In* Pacific Ports, September, 1921.

"For Introduction of Metric System," *In* Franklin Institute Journal, vol. 100, pp. 145-152; 1875.

Advantages of decimal system in computation too generally known to need restatement.

Frazer, P., "The Metric System of Weights and Measures," *In* Franklin Institute Journal, vol. 154, pp. 107-111; August, 1902.

Appreciates immense advantage of metric units over any other yet devised.

G

Gerrie, John H. (Business and Financial Editor, San Francisco Bulletin, and Pan Pacific, a world-traveled trade expert), "Answer to Attack on World Trade Club," *In* Pan Pacific, vol. 4, pp. 23, 24; November, 1919. (Reprinted in Booklet 6 issued by World Trade Club.)

(*See* also 2 articles in San Francisco Bulletin, 1919: 1. "Why Not Try It?" 2. "The 2 Stupidest Nations.")

"Why not try the exclusive use of the metric units in the United States of America? This is recommended in a resolution adopted by the U. S. American section of the International High Commission, of which Secretary McAdoo is chairman. This would seem the logical time for their adoption into world-wide use. They are in use in every civilized nation, excepting only the United States of America, and Britannia. Their exclusive use would greatly facilitate world commercial relations. The President and Premier Lloyd George can promulgate the metric system in ten minutes for America and Britannia to the benefit of all humankind. Try it; then go back to chaos if you wish." (From "Why Not Try It?")

"The American is entering upon world trade with the wrong kind of tools. At the outset of its expanded merchandising career, the United States of America is sorely handicapped in the fierce competition of the advanced trading nations of the earth." (From "The 2 Stupidest Nations.")

Gore, J. H., "Metric System and International Commerce," *In* Forum, vol. 31, pp. 739-744; August, 1901.

"With the forging of closer relations between men and men comes the necessity for the unification of all weights and measures—the indispensable and universal instruments of commerce. The metric system would aid us in selling; it would also help us to buy."

"Grams and Meters Enter World War Against Feet and Pounds," *In* Current Opinion, vol. 64, p. 72; January, 1918.

Soldier on field of battle took his orders in the metric units.

"Great Britain. Project for the Adoption of the Metric System and Decimal Coinage. Tables," *In* Economic World, vol. 100, pp. 116, 117; 28 July, 1917.

The insularity of British measurement and coinage is a very distinct impediment to easy financial and commercial relations with the world.

"Great Firm of Kynochs, Ltd., Birmingham, British Isles, adopts Metric System," *In* School Science and Mathematics, vol. 7, pp. 410-412; May, 1907.

"Compared with the size of our works and the magnitude of our transactions, the expense will be quite unimportant, and in any event it will repay itself in the first year."

Griffiths, F. G., "Plea for Metric System," *In* Medical Journal of Australia, vol. 1, p. 501; 16 June, 1917.

Guillaume, C. E., and Richards, H., "The Metric System Adopted in Japan," *In* Science, vol. 54, pp. 23, 24; 8 July, 1921.

"The importance of this event, significant in itself, becomes greater in view of the fact that this settles the supremacy of the metric system in the Far East and also practically in the whole world."

Guillaume, C. E., "International Bureau of Weights and Measures," *In* Scientific American Supplement, vol. 86, pp. 186, 187; 21 September, 1918.

Association created to assure thru the entire world perfect uniformity in the use of metric units.

H

"Hank Favors the Metric System," *In* Metal Work, vol. 91, p. 649; 23 May, 1919.

Hartigan, J., "Metric System: Importance of a Universal Standard in International Commerce," *In* Scientific American Supplement, vol. 83, pp. 175, 176; 17 March, 1917.

Tradition and custom and habit—brothers in misfortune—have dictated to our loss the U. S. American jumbled weights and measures. Metrics spread gospel of simplicity. They are a force to cement world relations.

Hauser, August, "Meter-Liter-Gram," *In* The Steward, pp. 26, 27; February, 1921. (See also The Steward, January, 1921.)

"It is not an academic question any longer. It is a detail of business of the most practical sort, and must eventually be recognized as of the greatest value."

"Hearings on Metric System," *In* Engineering and Mining Journal, 3 September, 1921.

Henderson, W. B., "Wanted: Uniformity in International Transactions," *In* Pacific Ports, pp. 48, 49, 98; September, 1920.

Hennessy, H., "On a Standard of Length," *In* Franklin Institute Journal, vol. 72, pp. 346, 347; 1861.

Not at all true that metric units are essentially French. Decimal arrangement is as much common property as the earth's axis.

Hering, C., "Discussion," *In* Engineers Club of Philadelphia Proceedings, vol. 19, p. 167; April, 1902.

"Our bids are in some countries set aside at once because the foreigners say, 'We cannot understand your figures, they mean nothing to us. We are used to the meter and we prefer to deal with the meter.' The result is that the French and German manufacturers get the orders that we ought to have."

Hess, H., "The S. J. Standard Metric Thread in Continental Europe," *In* American Machinist, vol. 23, p. 422; 3 May, 1900.

"To work with both millimeters and inches in the same shop and not infrequently on different portions of a single piece is too illogical an arrangement to maintain itself."

Hoffman, A., "The Metric System in the Machine Shop," *In* American Machinist, vol. 26, pp. 689, 690; 14 May, 1903.

"Makes no difference to man who works on machine, but great brain saver to those who calculate."

Holst, P. N., "Another Advantage of the Metric System," *In* Scientific American, vol. 121, p. 205; 30 August, 1919.

Not only decimal, but also establishes a relation between units of weight and length.

"The Horse Power in Metrics," *In* The Valve World, vol. 10, p. 97; March, 1913.

Defined by U. S. American Bureau of Standards as 746 Watts.

"How the Metric Campaign Advances," *In* The Valve World, vol. 10, pp. 135-137; May, 1913.

Engineers and graduates and students are a great part of the army of progress. They are the reserves of today who will be in the thick of the fight tomorrow.

Hubbard, N. Y., "The Duodecimal System," *In* Scientific American, vol. 88, p. 299; 18 April, 1903.

Watt proposed decimal division. Jefferson suggested decimal system. J. Q. Adams favored decimal base.

I

"Introducing the Meter and Gram in Denmark," *In* School Science and Mathematics, vol. 9, pp. 179, 180; February, 1909.

At length brains and judgment overcame ignorance, inertia, and ancestor worship, and on 9 March, 1907, an exclusive metric bill passed the 2d Chamber and became law.

"Institute of British Bankers Recommend Decimal System of Coinage," *In* Current Business Cyclopedia, vol. 3, p. 1196; 15 August, 1917.

The committee expressed the opinion that the existing British weights and measures are an obstacle to the extension of British trade.

Also, In Commercial and Financial Chronicle, p. 439; 4 August, 1917.

"International Bureau of Weights and Measures," *In* The Valve World, vol. 16, pp. 15, 16; January, 1919.

"International Conference on Electrical Units and Standards," *In* Nature, vol. 78, pp. 678-681; 29 October, 1908.

Recommend permanent steps for securing uniformity of standards in future.

"Investor," "The Metric System," *In* Engineering and Mining Journal, vol. 79, p. 670; 6 April, 1905.

"Is This a Strong Anti-Metric Argument?" *In* Valve World, vol. 14, pp. 239-241; August, 1917.

J

Jones, H. I., "Why Not Now?" *In* School Science and Mathematics, vol. 19, pp. 512-519; June, 1919. (Also published in pamphlet form.)

Wealthy Bolivian rubber grower ordered from German company at higher price than U. S. American company's charge. Why? Because U. S. American yards and sizes are Chinese puzzle; would rather pay more and know what he is going to get.

K

Karpinski, L. C., "Brief Historical Consideration of the Metric System," *In* Science, vol. 53, p. 1567; 18 February, 1921.

Karpinski, L. C. (Joint author with D. E. Smith of "Hindu-Arabic Numerals." Ginn & Co., 2301-2311 Prairie Avenue, Chicago, U. S. America. 1911. $1.25.) "Decimal System of Numbers," *In* Popular Science Monthly, vol. 75, pp. 490-498; November, 1909.

Decimal system only complete system ever developed. Traces history of decimal notation.

Kauffman, H. N., "Adopt the Metric System." *In* School Science and Mathematics, vol. 19, pp. 82-84; January, 1919.

The common good makes it necessary that the metric units be exclusively used in general practice.

Kennelly, A. E., Sc. D., "The Adoption of the Metric System in the United States," *In* Scientific Monthly, vol. 4, pp. 193-196; March, 1917.

"It is only inevitable that when we have 2 systems of units, one clumsy, complex, and crude, and the other simple and scientific, the complex system must give way."

Kennelly, A. E., Sc. D., "American Metric Association," *In* Oregon Society of Engineers Bulletin 18, pp. 2-4; May, 1917.

Kennelly, A. E., Sc. D., "The Metric System of Weights and Measures," *In* Popular Science Monthly, vol. 66, pp. 319-326; February, 1905.

"The adoption of the metric system by the United States would enable us to make great gains in our commercial standing in every quarter of the globe." No less than one year's school time would be saved if the metric units were taught in place of the present jumbled weights and measures.

Kunz, G. F., Ph. D., "The International Language of Weights and Measures," *In* Scientific Monthly, vol. 4, pp. 215-219; March, 1917.

"I believe that we have right now an unusual opportunity for making the metric system the American, as well as the International Language of Commerce."

Also, In Scientific American Supplement, vol. 83, p. 214; 7 April, 1917.

Kunz, G. F., Ph. D., "Metric System," *In* Nation, vol. 106, pp. 359, 360; 28 March, 1918.

"By using the metric system we should be intelligible to over 400,000,000 more of the world's inhabitants."

Kunz, G. F., Ph. D., "New International Carat of 200 Milligrams," *In* Scientific American Supplement, vol. 76, pp. 82, 83; 9 August, 1913, and pp. 98, 99; 16 August, 1913.

Achieved metric uniformity in jewelers' weights.

L

Ladd, E. F., (U. S. Senator from North Dakota), "Metric System Advantages," *In* New York Commercial, 21 February, 1922.

Lane, A. C., "The Metric System," *In* Science, vol. 19, p. 389; 4 March, 1904.

Suggests practical method of introducing metric units as exclusive standards.

"Learning the Value of the Metric System," *In* Scientific American, vol. 115, p. 4; 1 July, 1916.

Confutes contention of those who say that the exclusive introduction of metric units would prove expensive.

Le Conte, J., "Metric System," *In* Overland, vol. 6, p. 174; August, 1885.

Answers objections to metrics. Advocates units on account of metric simplicity. Ease of figuring with such a method. Great advantage to all practical engineers and machinists. Great economy in industry by using metrics. Advantage of a universal system.

Lees, J. L., "The British Decimal System," *In* Builder, vol. 111, p. 154; 15 September, 1916.

Profitable industrial changes are being made in almost every line. No less in scale and tool trades will a movement towards the World Metric Units awaken the spirit of enterprise.

"Letters for the Metric System," *In* Franklin Institute Journal, vol. 154, pp. 171-191; September, 1902.

Agree that the exclusive use of the metric units would be a great saving in time and money.

Lockett, A., "Converting Metric Formulæ Rapidly," *In* Photo-Era, vol. 37, pp. 18, 19; July, 1916.

"To convert, with the least of pains,
Ccs. to minims, grams to grains,
Multiply grams per liter by 10,
Or ccs. by 11; then
The solvent's right amount will be
Fluid ounces 20 and 3."

M

McAdie, A., "Metric System Slowly Coming Into Use," *In* The Valve World, vol. 11, pp. 226, 227; July, 1914.

Metrics displacing old units in weather maps.

McEachren, J. W., "Business and the Metric System," *In* Iron Trade Review, vol. 62, p. 161; 10 January, 1918.

Metric units should be the exclusive legal standards of weight and measure.

McEachren, J. W., "Chaos or Clarity in Our Metrology?" *In* The Valve World, vol. 10, pp. 180-182; June, 1913.

Substitute metric sanity and simplicity for present forbidding array of standards.

McEachren, J. W., "Encouragement from 'The Enemy'," *In* The Valve World, vol. 10, pp. 72, 73; March, 1913.

Once convinced that the change is inevitable the thing for us to do is to get together, prepare for it, welcome it, and have it over with as quickly as we can without undue disturbance to existing conditions.

McEachren, J. W., "Encouraging Interest," *In* The Valve World, vol. 9, p. 10; November, 1912.

Skilled mechanic writes: "I hope that this system will be demanded and established in the near future."

McEachren, J. W., "Fact and Fancy of the Metric System," *In* The Valve World, vol. 10, pp. 47-51; February, 1913.

Metrics bound eventually to supersede all other systems.

McEachren, J. W., "Halsey and the Metric System—Again," *In* The Valve World, vol. 11, pp. 319-321; October, 1914.

Adoption of metrics is 1st and most important step in order to put U. S. American goods into world markets.

McEachren, J. W., "Putting the Metric System Into Practice," *In* The Valve World, vol. 10, pp. 77-81; March, 1913.

No waste, no confusion, no cost comparable to saving. Would open to United States of America on equal terms the markets of the whole world.

McEachren, J. W., "What Will the Metric System Cost?" *In* The Valve World, vol. 9, pp. 3-8; November, 1912.

Cost relatively small and insignificant compared to advantages gained.

Martin, K. G., "Export Trade and the Metric System," *In* Iron Age, vol. 104, p. 715; 11 September, 1919.

Mayer, A. M., "Advantages of Metric System," *In* Franklin Institute Journal, vol. 94, pp. 278-285; 1872.

Uniform metric weights and measures inevitable.

"Measure to Secure Adoption," *In* Scientific American Supplement, vol. 49, pp. 20197, 20198; 24 February, 1900.

United States Steel Corporation endorses metric unit standardization. American Association of Steel Manufacturers and others urge adoption of House Bill 7251, making provision for exclusive use of meter-liter-gram.

Mendenhall, T. C., "The Metric System," *In* Popular Science Monthly, vol. 49, pp. 721-734; October, 1896.

"The advocates of the metric system welcome the presentation of all objections believing that the more widely it is known and discussed the more supporters it will have."

Mendenhall, T. C., "Presidential Address Before the Society for the Promotion of Engineering Education," *In* Science, vol. 10, p. 196; December, 1899.

"If it be affirmed that there is no demand for the change I could deluge the society with resolutions of chambers of commerce, boards of trade, manufacturers' associations, engineers' clubs, and societies, builders'

exchanges, architects' clubs, and so on—educational and scientific bodies and other public organizations too numerous to mention."

Mendenhall, T. C., "Weights and Measures of the United States of America," *In* Technical Quarterly, pp. 312-319; December, 1892. (Gives history of yard and pound, together with growth and adoption of metric world standards.)

Metlen, M., "How to Use the Metric System," *In* Scientific American, vol. 121, p. 157; 16 August, 1919.

"I think if the United States wants to capture a large part of the South American trade, it is bound to use the metric system."

"Metric Standardization Conference," *In* International Trade and Shipping Digest, vol. 2, p. 25; May-June, 1920.

"To organize the growing interest that has been shown of late in our need for standard measurements, the Metric Standardization Council—which is an organization of important manufacturing concerns and commercial associations—called the First World Metric Conference. Permanent officers for the council were elected at the conference and plans for the completion of the metric educational campaign were formulated."

"The Metric System," *In* Electrical Review, vol. 76, number 4, pp. 148-149; 24 January, 1920.

"Electrical men have no apologies to make for being ardent advocates of the metric system of weights and measures."

"The Metric System," *In* Scientific American, vol. 88, p. 370; 16 May, 1903. (For metric as compared to duodecimal system.)

"The Metric System," *In* Youth's Companion, 19 June, 1919.

"In every respect the metric system is better than our complex and antiquated system."

"Metric System and Decimal Coinage," *In* Nature, vol. 96, pp. 568-570; 20 January, 1916.

Points out evident overwhelming advantages of metrics.

"Metric System and the Decimal," *In* Westminster Review, vol. 131, pp. 280-285; 1889.

Present weights and measures complex. Cause needless study. Embarrassment in relations with other countries.

"Metric System Before Congress. American Metrological Society Urges Adoption of Metrics," *In* Science, vol. 23, pp. 515, 516; 30 March, 1906.

Present conflicting weights and measures are a serious obstacle to international trade and a hindrance to international co-operation in every direction.

"Metric System in Cuba," *In* Science, vol. 19, p. 807; 20 May, 1904. (Summary of consular statement explaining use.)

"The Metric System in Europe," *In* The Valve World, vol. 9, p. 21; November, 1912.

"Metric System in Great Britain," *In* Science, vol. 16, pp. 595, 596; 10 October, 1902.

Letter from Secretary of London Decimal Association shows widespread British demand for metrics.

"Metric System in India," *In* Scientific American Supplement, vol. 56, p. 23089; 15 August, 1913.

Principal consumers of imports of worsted decline to accept yarn made up otherwise than according to the metric standard to which they are accustomed.

"Metric System in Latin-American Trade," *In* Business Digest and Investment Weekly, vol. 24, p. 206; 12 August, 1919.

With some goods metric standardization is vital. A measure handicap is always against U. S. American goods even when the monopoly seems the most firmly established and, like a well-tempered coil spring, lies in wait to exert a full influence in favor of metric competitors whenever the pressure of other factors is released or becomes less.

"Metric System in the British Colonies," *In* Nature, vol. 74, pp. 614, 615; 18 October, 1906.

Exclusive use of metrics advocated owing to difficulties experienced in world commerce and prospect of continual loss of trade caused by present illogical weights and measures.

"Metric System in the Textile Industry," *In* Scientific American, vol. 87, p. 19; 12 July, 1902.

Standardization would considerably facilitate business in this industry between Britannia and the United States of America.

"Metric System in the United States of America," *In* Popular Science Monthly, vol. 61, pp. 185, 186; June, 1902.

Hearings before Congress show a variety of measures between Britannia and the United States of America. There is no chance for any of these units to become universal. "Unitannia" should adopt metrics.

"Metric System in the United States of America," *In* Practical Magazine, vol. 6, pp. 71, 72; 1876.

With powerful public sentiment in favor of metrics, it is desirable that the controlling voice [Congress] give signal for simultaneous movement toward actual abandonment of present needless multiplicity of units and substitute metrics.

"The Metric System. Objections Answered by the French Society of Civil Engineers," *In* Iron Age, vol. 72, p. 16; 8 October, 1903.

Metric units are in constant progress while the British are always dying out. Ultimate triumph of metrics is certain.

"The Metric System of Weights and Measures," *In* Nature, vol. 53, pp. 84-86; 28 November, 1895.

A deputation representing British Chambers of Commerce, waited upon Premier Balfour to urge the desirability of adopting metric weights and measures. Extract from Premier Balfour's reply:

"The solitary argument which appears to have been alleged on the other side is that the existing English system is a good gymnastic for the mind. I dare say it would be a very good gymnastic for the body, if, instead of having macadamized roads, we were obliged to make our way over pathless heaths and plunge thru ditches and over hedges; but . . . I do not think any one is likely to recommend that we return to the primitive kinds of locomotion once used by our forefathers."

"The Metric System of Weights and Measures," *In* Western Society of Engineers Journal, vol. 7, pp. 350-383; August, 1902.

W. O. Wilson, director of World Commercial Museum, Philadelphia, United States of America:

"Millions of dollars are lost every year in transposing our weights and measures and money from the system of one country to another in our international business relations."

Microcrith, "The Metrical System," *In* Knowledge, vol. 1, p. 99; 2 December, 1881.

British are irresistibly drawn to metrics in all scientific and practical measurements, notwithstanding the dense barrier of insular prejudice most detrimental to the islander.

Miller, A. W., M. D., "Wholesale Druggists and the Metric System," *In* Scientific Monthly, vol. 4, pp. 210-214; March, 1917.

Well known advantages of metric units: simplicity, uniformity, decimal, convenient convertibility of one unit to another, clear manner in which nomenclature expresses exact values, and the security of an unalterable base.

Miller, F. J., "Metric System of Weights and Measures," *In* Science, vol. 37, pp. 941, 942; 20 June, 1913.

No foundation for misconception that constructors and users of machinery would be forced to sacrifices.

Miller, K., "Scales of Denominate Units," *In* Education, vol. 22, pp. 468-476; April, 1902.

Confusion as a result of different weights and measures would be ended by metric unit standardization.

Miller, T. H. (Superintendent of The De Laval Separator Company), "A Letter to the Editor Favoring Metrics," *In* The Valve World, vol. 10, p. 142; May, 1913.

Miller, T. H., "The Metric System in an American Factory," *In* Machinery, vol. 26, pp. 1128-1129; August, 1920.

How the De Laval Separator Company advanced from the English to the metric units. There was large gain from the advance and no confusion

or serious disturbance. It was not necessary to throw away patterns, gages or tools made to the English system.

Molitor, David A., "The Metric System of Weights and Measures," *In* Michigan Architect and Engineer, January and February, 1922, (2 parts.)

"Move for Uniformity in Systems of Measurements," *In* Engineering Magazine, vol. 51, pp. 749, 750; August, 1916.

Move for world oneness deserves consideration. Helps to do away with war.

"Movement Started to Extend Scope of Use of Metric Measures in the Jewelry Trade," *In* Service Bulletin (National Jewelers' Board of Trade), p. 2; 4 October, 1920.

"The Board is heartily in favor of this plan and believes that it should be given support by all the jewelry trade associations."

N

"New Units in the Metric System, Legally Adopted in France," *In* Scientific American Monthly, vol. 2, p. 152; October, 1920.

O

Ortmann, A. E., "The Metric System," *In* Science, vol. 20, p. 506; 14 October, 1904.

Old names do not persist in Germany except in a few cases where they represent metric values.

P

Patterson, A. H., "Lest We Forget," *In* Science, vol. 37, p. 488; 28 March, 1913.

Make a long pull, a strong pull, and a pull all together and get United States Congress to adopt metrics.

Pawling, Jr., J., "Discussion," *In* Engineers Club of Philadelphia Proceedings, vol. 19, p. 165; April, 1902.

"I find it just as easy to think in centimeters as in inches. The word 'centimeter' conveys just as definite an idea as the word 'inch'; it certainly conveys a more complete idea than 'inch,' as the 'centimeter' states what part of the meter it is, while the inch does not tell its relation to the foot."

"100,000 Petitions for the Metric System," *In* Journal of the American Institute of Electrical Engineers, vol. 39, p. 889; October, 1920.

It is reported that the Department of Commerce at Washington, D. C., has received over 100,000 petitions from all over the United States urging upon Congress the adoption of the metric system of weights and measures as the exclusive legal standard.

"Plea for Metric System," *In* Science, vol. 23, pp. 73, 74; 12 January, 1906.

U. S. Congress should awaken to the fact that this is century 20 and comply with the demand for exclusive use of meter-liter-gram.

"Points in Favor of the Metric Bill," *In* Lefax ("Useful Facts Concentrated," by Lefax, Inc.), pp. 37-42; April, 1921.

"Position of the Metric System," *In* Nature, vol. 79, p. 501; 25 February, 1909.

Preferred by practically every government in the world. In this advance there has been no retreat.

"A Practical Question," *In* The Valve World, vol. 10, p. 161; May, 1913.

Metrics used by manufacturers. Crane Co., makers of world famous valves: "We have done it; it has been done; it is being done; and before many years it will be done universally."

Price, A. J., "The Metric System," *In* Surveyor and Municipal and County Engineer (London), vol. 50, pp. 300-302; 6 October, 1916.

Adoption of metric units will remove the chief handicap in U. S. American competition with rest of world.

"Progress of the Metric System in the United States," *In* Engineering News, vol. 43, p. 310; 10 May, 1900.

Ever-increasing use in U. S. Government work and by manufacturers.

Putnam, J. P., "Architects on Metrics," *In* American Architect, vol. 1, pp. 198-200; 17 June, 1876.

Keep subject before the public until steps taken by government. Quotes J. Q. Adams: "It is one of those attempts to improve the condition of humankind, which, should it even be destined ultimately to fail, would in its failure deserve little less admiration than in its success."

Putnam, J. P., "Some of the Advantages of the Metric System to Architects and Builders," *In* American Architect, vol. 3, pp. 79, 80; 2 March, 1878.

"With our worse than barbarous conglomeration of standards the waste of time and money in all the various works of life becomes as serious as to rank among the most formidable obstacles to the advance of our civilization. The only remedy is universal adoption of the metric standards."

Q

Quick, H. P., "English and Metric Scales on Plans and Some New Conversion Tables; with Insert Sheet of Tables," *In* Engineering News, vol. 71, pp. 550, 551; 12 March, 1914.

Confusion exists where U. S. American engineers have to prepare plans for world engineers. Metric standardization is the remedy.

R

"Recent Progress in the Metric System," *In* Nature, vol. 93, p. 483; 9 July, 1914.

Metrics would not put out of use machines the dimensions of which could not be expressed in convenient metric units. Modification would be necessary only when replacing machines by new ones.

"Recent Progress of the Metric System," *In* Nature, vol. 77, pp. 611, 612; 30 April, 1908.

"Reform in Meteorological [Science of Weather] Units," *In* Scientific American, vol. 102, p. 294; 9 April, 1910.

Meteorology is burdened with a dual system of units. Should adopt Centigrade uniformity in place of German scrapt Fahrenheit records.

"Relation of the Metric System to the Triumph of German over Anglo-Saxon Efficiency," *In* Current Opinion, vol. 60, p. 186; March, 1916.

"Few Americans suspect the decided nature of the advantage enjoyed by Germany over the Anglo-Saxon world thru her adoption of the metric system."

"Report of Committee to House of Representatives," *In* Science, vol. 15, p. 829; January-June, 1902.

"Adoption of the metric system has been repeatedly recommended by the departments of the government and congressional committees."

"Report of Metric System Committee," *In* National Wholesale Grocers' Association of U. S. America, Annual Report, 1919. Chairman: Fred R. Drake, Drake & Company, Easton, Pennsylvania.

"Report on the Metric System," *In* Scientific American Supplement, vol. 53, pp. 22036-22038; 10 May, 1902.

"Our various units have been inherited from a time when exact measurements were unheard of, computations were seldom made, and when each locality and different interest had its own system of measures."

"Resolutions of Congress Legalizing Metric System," *In* Franklin Institute Journal, vol. 82, pp. 268-271; 1866.

Richards, H., "Britain's Proposed Decimal Coinage Bill," *In* Valve World, vol. 15, p. 351; October, 1918.

Richards, H., "Meters, Liters, and Grams for the Allies," chart, tables, *In* New France, vol. 3, pp. 426-428; March, 1919.

"No reason supports our decimal system of currency that does not support a decimal system of measures."

Richards, H., "Metric System," *In* Scientific American, vol. 121, p. 287; 20 September, 1919.

"Metric weights and measures should be applied to each trade and industry in the most convenient manner keeping the convenience of others in view."

Richards, H., "Practical Application of Metric System," *In* Metal Work, vol. 92, p. 42; 11 July, 1919.

Metric units should be the **exclusive legal standards** in the United States of America.

Richardson, H. W., "The Metric System," *In* Harper's Monthly, vol. 81, pp. 509-513; September, 1890.

Wide variety of weights and measures in the United States of America makes metric standardization essential in national as well as in world trade.

S

Schuhmann, G., "Our Present Weights and Measures and the Metric System," *In* American Society of Mechanical Engineers Proceedings, vol. 28, pp. 1179-1184; December, 1906.

"I know of no better medium than the metric system to facilitate the acquisition of that knowledge which is necessary to the engineer to enable him most effectively to adapt the achievements of science to the use of mankind."

"Scientific and Practical Metric Units," *In* Nature, vol. 102, pp. 153, 154; 24 October, 1918.

"It is absurd for the ordinary sensible man to be kept in ignorance of the units with which scientific men work."

Scott, David, "The Metric System and the Aeronautical Industry," *In* Aeronautics, vol. 16, pp. 26-27; 1 January, 1919.

Plea for the adoption of the metric units.

Seaman, W. H., "Bill in the British Parliament," *In* Science, vol. 21, p. 72; 13 January, 1905.

Adoption of the metric units by one branch of the English race will secure its adoption by the other.

Seaman, W. H., "International Weights and Measures," *In* Engineering and Mining Journal, vol. 79, pp. 286, 287; 9 February, 1905. (Summary of considerations favoring metric standardization.)

Shaw, N., "Units and Unity," *In* Nature, vol. 101, pp. 326-328; 27 July, 1918.

"It is time for those who think that a unified system of measurement is worth having to make a push for it."

"Should We Adopt the Metric System?" *In* Hearst's Magazine, August, 1920.

Practical business reasons why the standards of measurement should be internationalized.

Siemens, A., "The Metrical System of Weights and Measures," *In* Royal Statistical Society Journal (British), vol. 66, pp. 688-719; December, 1903.

Metric advance of very little cost to shopkeeper; infinitesimal compared to saving in time. Actual weights and measures a small factor. With lever machines easy to change marking of steel-yard. Cost would be very small indeed.

Siemens, A., "The Metric System," *In* Electrician, London, vol. 50, p. 730; 20 February, 1903.

"The public will soon find out what a blessing the abolition of the various and perplexing tables of weights and measures will prove to be, and how superior the metrical system is."

Also, In Institution of Electrical Engineers of Great Britain Journal, vol. 32, pp. 278-284; 22 January, 1903.

Siemens, A., "Metric System: An International Unit of Weights and Measures," *In* Nature, vol. 93, pp. 390-392; 11 June, 1914.

Metrics are the only possible world units.

Also, In Scientific American Supplement, vol. 78, p. 6; 4 July, 1914.

Siemens, A., "Presidential Address before the Institution of Electrical Engineers of Great Britain, 10 November, 1904," *In* Electrician, London, p. 149; 11 November, 1904.

"It is much to be regretted that such a useless encumbrance of our daily life and such an obstacle to foreign trade, as the English system of weights and measures, has not yet been abolished."

Sonnenschein, A., "The Metric System," *In* Society of Arts Journal, vol. 51, pp. 170-178; 23 January, 1903.

"The metric system provides a remedy for grave inconveniences caused by present varying units and practices in wholesale and retail markets, in the counting-house, in foreign trade, and in the school-room."

Spear, J., "The Metric System," *In* Popular Science Review, vol. 4, pp. 54-66; 1865.

Metrics destined eventually to supersede all other units, whether good or bad.

Spillman, W. J., "The Metric System Again," *In* Science, vol. 21, p. 587; 14 April, 1905.

Ridicules present lack of system. Shows elasticity of value in 5 different uses of the term "gallon."

"Standardized Electric Motor Manufacture," *In* Electrician (London), p. 251; 25 February, 1921.

Messrs. Higgs Brothers of Birmingham adopted the metric units and found saving and advantages rather than cost and difficulty.

Stevens, W. L., "The Metric System," *In* Science, vol. 19, pp. 534-536; 1 April, 1904.

Essential features of metric standards: 1. A decimal relation between all units. 2. A direct and simple relation between units of length and mass.

Stevens, W. L., "The Metric System: Shall It Be Exclusive?" *In* Popular Science Monthly, vol. 64, pp. 394-405; March, 1904.

History of the standards of measurement shows the need of uniformity for world commerce.

Stewart, E., "A Crisis for the Metric System," *In* Scientific American, vol. 121, p. 205; 30 August, 1919.

The meter works while we sleep, counting out the dollars which drop into the pockets of our competitors.

"Still Our Platform," *In* The Valve World, vol. 16, p. 6; January, 1919.

Crane Co., makers of world famous valves:
"International Standardization of sizes.
"An International System of Weights and Measures.
"An International Standard of Currency and Exchange.
"International Merchandising and Banking Methods.
"International Confidence and Good Will Generally."

Stratton, S. W., "The American National Bureau of Standards," *In* Engineers Club of Philadelphia Proceedings, vol. 19, pp. 155-165; April, 1902.

"There is no doubt in the mind of any thinking person but that a universal system must soon be adopted, and no system offering advantages equal to that of the metric system has yet been devised."

Also, In Franklin Institute Journal, vol. 153, pp. 81-92, February, 1902.

Stratton, S. W., "The National Bureau of Standards," *In* Western Society of Engineers Journal, vol. 7, pp. 329-346; August, 1902.

Metrics save ⅔ of one year in life of school child is the lowest estimate given by an official investigation. In the lifetime of a single generation nearly $1,000,000,000 and 40,000,000 school years are consumed in teaching jumbled units which are in harmony with standards of no other nation in the world.

Stratton, S. W., "Weights and Measures," *In* Engineers' Society of Western Pennsylvania Proceedings, vol. 19, pp. 98-106; March, 1903. (Reviews what has been done by U. S. American Government in regard to fixing standards of weights and measures.)

Stubbs, A. J., "A Case for the Adoption of the Metric System in Great Britain," *In* Institution of Electrical Engineers of Great Britain Journal, vol. 56, pp. 125-135; February, 1918.

Logical and reasonable procedure is do it now.

Swingle, W. T., "Simple Metric Conversion Table; Changing Metric Units Into English Equivalents," *In* Scientific American Supplement, vol. 67, pp. 190, 191; 20 March, 1909.

T

Telford, F., "Everyday Uses of the Metric System," *In* The Valve World, vol. 11, pp. 43-47; February, 1914.

"Few people realize how widely the metric system of weights and measures is employed in this country. Yet sportsman and scientist, druggist and jeweler, farmer and physical director, housewife and health officer, librarian and manufacturer, even the Federal Government—all know and use the metric system."

"Text of Bill to Establish Metrics in British Isles," *In* Nature, vol. 3, pp. 448, 449; 6 April, 1871.

Thompson, J. B., "The Metric System," *In* University of New York State Regents' Reports, vol. 86, pp. 659-680; 1873.

Shows defects of present illogical and jumbled weights and measures in comparison with metric uniformity.

Thun, A. F. (Secretary, Textile Machine Works, Reading, Pennsylvania), "Using the Metric System," *In* American Machinist, vol. 47, p. 934; 29 November, 1917.

"We are partial to the metric system for the reason that we have been using it in some part of our work for the last 20 years. Our reason for this position is due to the fact that we had to adopt the European standards in order to be able to compete in the world's markets for some of our specialties."

Turner, F. W., "Thoughts on the Practical Use of the Metric System," *In* School Science and Mathematics, vol. 7, pp. 8-11; January, 1907.

Conservatism the main difficulty to advance. Metrics should be taught in all the schools, from the lowest to the highest.

U

"United States and the Metric System," *In* Scientific American, vol. 86, p. 343; 17 May, 1902.

"From the standpoint of dollars and cents, the standpoint of the American exporter, the metric system should certainly commend itself."

"Use of the Metric System in the United States," *In* Science, vol. 48, pp. 540, 541; 29 November, 1918.

Resolutions adopted by U. S. American Section of International High Commission on Uniformity of Laws favoring exclusive use of metric units in United States of America in order to foster Pan-American commercial relations.

Also, In Scientific Monthly, vol. 8, pp. 95, 96; January, 1919.

"Using the Metric System," *In* Independent, vol. 88, p. 54; 9 October, 1916.

War has aroused British interest in metric units. In schools it should be and can easily be taught in likeable manner. Necessary for trade.

V

Vye-Parminter (Architect), "The British Decimal System," *In* Builder, vol. 111, p. 125; 1 September, 1916.

"We must at once scrap our old complicated system of weights and measures."

W

Wade, H. T., "Metric System," *In* Scientific American, vol. 123, p. 125; 7 August, 1920.

Why we should weigh and measure without reservations in meters, liters and grams.

Wade, H. T., "Standardization and the United States," *In* Iron Trade Review, vol. 62, pp. 321, 322; 31 January, 1918.

Metric units are best fitted for standardization work.

"War and the Metric System," *In* Literary Digest, vol. 51, pp. 1280, 1281; 4 December, 1915.

Metric units should be the exclusive legal standards because of their simplicity and benefit in world commercial dealings.

"Weights, Measures and Money of the Various Countries with Their English Equivalents," *In* International Rural Science and Practical Agriculture, pp. 9-11; January, 1919.

Welliver, J. C., "The Metric System, the Increasing Prospect of its Adoption in the United States," *In* Munsey's Magazine, pp. 490-493; April, 1916.

"Conservatism must give way to a good system that is also a universal system."

Wells, W. C. (Chief Statistician, Pan-American Union, Washington, D. C.), "The Metric System and Our Foreign Trade," *In* American Review of Reviews, vol. 55, pp. 542, 543; May, 1917.

United States of America needs metric standardization in order to get world trade. Most of the world uses metric units, and it is only our lack of gumption that keeps us back from this important industrial advance.

Wells, W. C. (Chief Statistician, Pan-American Union, Washington, D. C.), "The Metric System from the Pan-American Standpoint," *In* Scientific Monthly, vol. 4, pp. 196-202; March, 1917.

"We must adopt the metric scale because of its simplicity and because nearly all the rest of the world has adopted metric units. This world is the market in which we must buy and sell."

"Why Fear the Improbable?" *In* The Valve World, vol. 10, pp. 139, 140; May, 1913.

"The throwing of 'old gauges and rules in the scrap heap' would not in the least affect repairs to existing installations; the measurements would merely be made in metric instead of English units."

Williams, R. P., "Calendar Reforms and Metric Reforms," *In* School Science and Mathematics, vol. 7, pp. 457-461; June, 1907.

"If opponents will take a fair view they will see that the utmost they can do is to hinder for a brief time the advance to metrics; to make young students waste a few more years of life over doggerel weights and measures, to try to block the course of U. S. American commerce with foreign nations, to attempt to hinder the inevitable law that the best will finally survive."

Willmott, A. B., "The Metric System," *In* Engineering and Mining Journal, vol. 79, pp. 766, 767; 20 April, 1905.

"The change from our present lack of system should be gradual, and if so, the objections disappear."

Windsor, H. H., "Adopt Metric System," *In* Popular Mechanics, vol. 32, pp. 178, 179; August, 1919.

"With a closer working understanding of mutual interests than ever before, the present surely offers a most favorable time for Great Britain and this country to get in step with the rest of the world in this important matter."

"A Wonderland of Science," *In* National Geographic Magazine, vol. 27, pp. 153-169; February, 1915.

Bureau of Standards endeavoring to secure uniform legislation on weights and measures. False measures have a habit of running away from progressive laws.

"The World-wide Spread of the Metric System," *In* The Valve World, vol. 11, p. 51; February, 1914.

A report issued by the London Decimal Association shows time soon coming when metric usage will have to be adopted in dealings with the Far Eastern countries.

(See also many quotations from newspapers and periodicals, in Chapter 9, "Who Urges Meter-Liter-Gram?")

CHAPTER 15

A DISCREDITED DOCUMENT

THE preceding chapter, "Look It Up," gives a list of dependable printed sources of information on world metric standardization. NOT listed in that bibliography is a printed document issued in October, 1921, entitled "The Metric *versus* the English System of Weights and Measures." It is called "Research Report Number 42," of the National Industrial Conference Board.

Irreconcilables Dominate Report

This report cannot be recommended to any seeker after the facts for it contains much material which is fallacious and misleading. To even the casual reader it is apparent that in the main it was written by individuals who are at heart enemies of the world metric advance. In effect, it is a piece of Anti-Metric Propaganda, and this is explained when it is seen that the majority of the committee which guided its preparation have been for years actively fighting the world standards for the United States of America. The attitude of these 3 "irreconcilables" was well known when they were appointed; so that this is, to use the phrase of political machinists, a "safe" committee—"safe" for the interests blocking the metric advance—with its report predetermined.

Commenting on this fact, Dorr E. Felt, an eminent manufacturer and a member of the Board of Directors of the Chamber of Commerce of the United States, wrote on 10 November, 1921, that the dominant 3 members of the committee "have been quite active in an aggressive organization to oppose the introduction of the metric system. I would hesitate to accept any final conclusions of the majority of that Advisory Committee."

The issuance of a report under such auspices is calculated to place the National Industrial Conference Board in a false position, counter to its own best interests. It is truly regrettable that the Board was led to allow its imprint to be placed upon this document which was discredited even before it was issued. Doubly unfortunate is it, because the report makes pretense to being "impartial," a mask of hypocritical camouflage which is easily penetrated. Yet the book will go to the public libraries, educational institutions, organizations, industrial concerns, and national legislators, and the effect will be to bewilder and mislead those who are honestly seeking to search out the facts as to the metric advance. It is even

likely to be gravely quoted sometimes as "authoritative," whereas it is only a "written-to-order" document (done with truly Teutonic thoroness and bias) trying to make the best of a bad case.

Great World Facts Are Ignored

No detailed refutation of the anti-metric arguments in the "impartial report" is required here. The material herewith, in "World Metric Standardization: An Urgent Issue," is ample rebuttal of those anti-metric contentions and theories. Moreover, the report condemns itself by its manifest unfairness. Upon its face the report bears the date, "October, 1921." At that time the facts were well known as to the exclusive adoption of metric units by both Japan and Russia in 1921. Yet no emphasis is placed upon either event. In a **footnote** on page 32, the metric advance by the great Empire of Japan is recorded in the smallest type, occupying scarcely 10 millimeters of space in a volume of 261 pages. The metric advance by Russia, which was confirmed long before October, 1921, is passed over in silence. Thus it is apparent that the "impartial report" was blind to the great metric news events of the world, and was already **out of date** on the very first day of its issue.

In their eagerness to make a case for what they call the "English system" (it is of German origin, and not a system), the "editors" lay themselves open to the charge of wilfully ignoring world-known facts. However, facts cannot be "edited" out of existence; so they may now be cited to show the falsity of some of the anti-metric "statistics." On page 16 of the Report it is stated, "**Russia,** the United States, Great Britain, and certain of their dependencies . . use the English system as the predominant system of weights and measures." The same statement is repeated elsewhere. As a result of counting Russia as using "the English system," it is declared that altogether 343,557,000 people use the English units.

Russia Never Used "British" Units

The statement that Russia employs the "English" as "the predominant system" is not true, and never was true. In the "Statesman's Year Book" (a British authority), the **old** (now obsolete) weights and measures of Russia are recorded: **Verst, sajene, arshin, dessiatine, pound, pood, vedro, chetvert**; so on. These were **not** "English" units. The Russian "pound," for instance, was .90283 of a "British" pound avoirdupois. The "pood" was .32243578 cwt. The "verst" was .662879 of a statute mile. The "vedro" was 2.7056 "imperial" gallons; and the "chetvert" was 5.7719 "imperial" bushels.

If it were true (which, of course, it is not) that Russia did once employ "the English system," then that "system" has **failed** in Russia, for that country has expressed its decision to advance to

the world metric units, and not to retrogress by going over to the unstandardized "English" units. The determination to standardize on the world units was declared both under the former regime in Russia, and also under the present regime. The barbaric Russian units are already obsolescent, and doomed to extinction. Not only Russia, but also virtually all the former Russian territories, have cast them out and have provided for exclusive use of the metric units. Poland, Finland, Latvia, Esthonia, Lithuania, and other countries once under the Czar, are now on the metric basis.

It is apparent that Russia should not be reckoned with the countries "using English weights and measures," but rather should be classed as metric. That takes 164,000,000 people out of the total falsely claimed for the "English" systems. In other words, there is at least 50% error in this anti-metric tabulation.

In the "Report" it is acknowledged that the metric units are employed predominantly by countries having a total population of 395,521,000. Russia and Japan are not included in that total, tho their metric position was well known in 1921. Adding them to the countries committed to the metric units, the total figure becomes 638,000,000. To this figure should be added the population of other countries which should be included in the metric total—such, for instance, as Cuba, Panama, Porto Rico, San Domingo, Ecuador, Peru, Bolivia, Costa Rica, Salvador, Guatemala, Honduras, Greece, Siam, Tripoli, Palestine, Syria, and many others. China, too, is definitely advancing to the metric units under legal enactments; but even omitting China from the count, the population of countries using the metric units outnumbers those retaining the diverse "British" units at least 4 to 1. (And China, of course, should be added.)

Lessons of World War Ignored

This exposure of how some anti-metric propagandists are willing to juggle with the facts and figures in an effort to bolster up their claims, indicates also their general method of attack. They support their contentions by arguments uttered, in the main, before the World War —apparently placing undue reliance in a similar made-to-order "report" rendered as long ago as 1906. It is well known that the World War utterly altered world conditions. Yet the World War itself, and the teachings it carried as to the vital need for world standardization, are barely touched upon by this report issued in 1921. When the World War is mentioned, it is as if by accident. No reference is made to the tremendous loss of life and treasure as the result of prolongation of the World War thru lack of world metric standardization.

Bearing out the statement that this "report" was out of date even before issued, it should be noted that the trade statistics quoted are chiefly for the years 1918 and 1919, or before. If the 1921 and 1922 statistics were printed, they would show that the United States has lost and is losing world trade in virtually every world market. This is partly due to lack of the world understandable metric units.

One of the main indictments against this "report" is that it is not "on the question before the House." In other words, it virtually ignores the liberal provisions of the Britten-Ladd Bill, which provides that Manufacturers may continue to use in production any weights and measures which they desire, but that after 10 years products shall be **described** in terms of the world metric units. Industry is therefore **exempt** from use of metric units within factories; yet no cognizance of this fact is taken in the anti-metric arguments. The text of the Britten-Ladd Bill is **not** printed; even a summary is **not** given. Yet the Britten-Ladd Bill represents the **only** proposal of metric advocates before the Congress of the United States of America. The anti-metric propagandists do not argue against what is actually proposed, but against a hypothetical proposal which they assume someone is making, to the effect that production machinery shall be "scrapt." In this way, they seek to scare propaganda funds out of deceived manufacturers. The whole unfair attitude of the antagonists of the metric advance is typified by the fact that they persist in talking about "**compulsory** adoption" of the metric system, whereas they know that all that is proposed is **exclusive use of the metric units in merchandising** within the jurisdiction of the United States of America. But they seek to stir up unreasoning prejudice by use of the word "compulsory."

Obsolete Units Are Not "English"

Another sentimental appeal is attempted by calling the diverse weights and measures "English." This gives scant consideration to the people of the United States of America, Canada, Australia, New Zealand, Union of South Africa, Ireland, Scotland, Wales; and furthermore it has been shown that the old weights and measures retained in those countries are really German and not "British" in origin.

In referring to the metric "report" bearing the imprint of the National Industrial Conference Board, **W. Mortimer Crocker** (executive representative in Washington, D. C., of the World Metric Standardization Council) wrote: "The book begins with an unfortunate error, and that error is the title itself. The word "English" is here a complete misnomer. It is noted later in the book that the systems referred to are the British and the United States sys-

tems, which differ materially with respect to linear, weight, and dry and liquid capacity measures. This false impression that we use the English measures is unfortunate and is the cause of endless confusion in statistics, price quotations, and technical literature. A gallon is not the same in Canada as in the United States, nor is any other liquid unit, nor dry unit. The bushel is not the same in Canada or England as in the United States. And so of all the derived units. England has abandoned the troy pound and exclusively uses the 'long' ton, whereas the 'short' ton prevails generally in the United States. Even the definition of the yard is technically different in the 2 countries. In fact the system is so different as used in British Isles and Canada from the system used in the United States that the title of the book merely serves further to confuse and bewilder the reader, and to conceal the real fact that the United States has a different system of weights and measures from that of Britain and Canada. The blunder in the title of the book is particularly regrettable since the book itself claims to be 'impartial.'

" 'Ethnic system' is a term used in this report which seems to imply that there is something nationalistic about ideal weights and measures. The real question is whether a universal system can be adopted. The answer is, it has been adopted as the single standard for all the sciences, and also for all uses in at least 40 important countries of the world.

Antagonists Defend Barbaric Jumble

"Survivals of old usages have absolutely no bearing on the efficiency of the new. The ox-cart of rural Maryland (East Shore) does not imply that the automobile and tractor are failures. Yet the whole contention as to persistence of old units is built on this fallacy. It is not a question of introducing the metric system. It is already here. We have 2 sets of units. Which is the better, is the only question worth discussing."

In reading sections of the anti-metric "report," where an attempt is made to show that certain awkward, obsolete units still hang on among some country-folk or in certain obscure crafts in metric countries, the reader is led to wonder, "What is the object of all this?" Is the object to indicate that we should encourage the obsolete jumble by holding out against the world uniform units? When obstructionists gloat over the alleged survival of some barbaric unit in some outlandish places, the question insistently arises, "On what side are these propagandists; on the side of barbarism or civilization?" They condemn themselves out of their own mouths; they clamor for the mongrel jumble against the uniform world system! They are backing the verst, the koku,

the quart, the oke, the inch, the pood, the maund, the vara, the bushel, the karob, the picul, the momme, the catty, the libra, the canne, the morgen, the cubit, the tola, the hundredweight of 112 pounds, the ton of 2000 or 2240 or some other number of pounds, the barrel of diverse dimensions and capacity—all these, and 1000 others, they are backing against the 3 world-uniform units—meter, liter, gram.

Typical of their attitude is the reprint of the "Table of Units of Linear Measure Corresponding to the English Foot," which appears on page 7 of the "impartial report." The antique units approximating the "foot" are cited, but there is no indication either on the table or in the text that virtually all of these are **scrapt units**, found unsuitable, and cast aside in a world-wide advance to the metric units. Tho many of these obsolete units were divided into 12ths, the nations that once used them have advanced to units more conveniently divided into 10ths. The table of dead units (all differing materially) is not much of an advertisement for the barbaric jumble, nor for the intelligence of the English-speaking peoples, for they alone cling to the ancient unit based on the foot of some royal rogue. Of the countries cited in that diagram, all have advanced to the meter and its subdivisions except the British and the Americans. It should be noted that they all can utilize 30 centimeters, the equivalent of the old "foot," but standard and invariable thruout the world. (Or, if they desire, they can utilize the ⅓ meter.)

Unfortunate Bias Displayed

The biased attitude of the "editors" is shown on almost every page, but space is here lacking to further expose such lapses, even were it worth while. No credit is given James Watt, that truly great Briton, for working out the plan which became the metric system; his name is not even in the Index of this book. No credit is given George Washington (to instance another example of unfairness) for his advocacy of **world** uniformity of weights and measures. On page 36 of the "report," it is said: "President Washington in his first message to Congress made special reference to weights, measures and currency, as 'a subject of great importance,' which, he was persuaded, should be 'duly attended to.'" But no mention is made of the fact that Washington at that time urged that uniformity of weights and measures be derived from **"a standard at once invariable and universal."** (See page 148, this volume.)

On page 197 of the "report" it is claimed that the Chamber of Commerce of the United States is opposed to metric standardization. This is not true. So far from opposing it, that great organi-

zation has appointed a special committee to study it, has devoted important meetings largely to a discussion of this subject, and on at least 2 occasions has gone on record expressing a desire that the subject of metric standardization for the United States shall receive "sympathetic consideration." It should be noted that the "report" lists a number of associations alleged to be "unalterably opposed to compulsory use of the metric system," but does not state their attitude as to the liberal Britten-Ladd Metric Standards Bill. Above all, no such list is given of the several hundred important national organizations, commercial and industrial associations, which urge gradual metric standardization on the basis of the Britten-Ladd law, tho such a list was furnished by the World Metric Standardization Council.

W. Mortimer Crocker, in his commentary on the "impartial report," wrote: "A clean-cut decision is made impracticable from the statements made. It is a well-known artifice which gives a false impression that the 2 cases are nearly in balance, and that therefore a change is scarcely worth while. The fact is that the change is very much worth while, but the confusing presentation by a divided committee will help but little in reaching a wise decision—and confusion is what the anti-metric people want. It is thus in effect an anti-metric book, despite admissions which could not be avoided. The case for the metric system is so overwhelming, and the verdict of science (and the nations) so unanimous, that it is unfortunate that inertia seems to be the dominant note in the book."

Claim of "Impartiality" a Farce

The introduction to this report declares, "The 3rd part sets forth in a judicial spirit, *without taking a position either one way or the other,* the arguments advanced by advocates of the metric and the English systems respectively." Analysis of that 3rd part will reveal to anyone with measuring stick in hand that approximately 3 times as much space is allotted to the anti-metric arguments as to the metric statement. One page in support of the world system is offset by 3 pages apologizing for the mongrel jumble mis-called "English." This is a doubtful showing of fairness and impartiality, but is not out of keeping with the general tone of the book.

It is set forth that proponents of the old units allege "that many persons have been led to lend their support to the movement for a change to the metric system thru ignorance of the situation." This charge of Ignorance is astounding, when it is remembered that Education thruout the United States is unanimous for the metric system, and that the leaders in every field

(including Manufacturing) strongly urge the advance. (Look at the names in the book now in your hand.)

Obsolete Jumble Scrapt and Discredited

It is valuable to learn that "proponents of the 'English' system deny that there is any scientific superiority in the fundamental metric units" and that they claim the old "system superior in every way to the metric system." Not only are these statements made, but effort is put forth to bolster them up. But in view of this alleged "superiority" some explanation should be forthcoming why no nation has ever taken up the jumble thus championed, and why scores of nations, after thoro investigation and discussion, have scrapt it. Japan and Russia scrapt it in 1921. In that one year more humans went over to the metric units for future transactions than now use the diverse "British" units in all the world! Yet we find the "editors" allowing their book (issued 1921) to conclude with this monumental absurdity: "The English system is rapidly coming to be fully recognized as the ideal system, destined for this reason ultimately to come into universal use." And that in a year in which more than 200,000,000 of the world's people had decisively rejected the unrelated units which different English-speaking peoples have been so foolish as to retain till this late date.

The year 1921 made the "editors" of this "report" appear doubly foolish. Most reporters are expected to find out the world's events promptly and record them. The "reporters" of this "report" apparently were expected to ignore the world's events—especially the advance of 200,000,000 people to the world metric units. Because some reporters don't get the facts they are "fired." Because other reporters are able not to get the facts they are "hired."

It is true that the distinguished minority members of the committee succeeded in having some of the real facts as to the world standard units included, but unfortunately these were given subordinate position and overwhelmed by the mass of biased material. From the outset, the metric advocates were placed at a manifest disadvantage.

In conclusion, it should be stated that it is not presumed that the National Industrial Conference Board would willingly or wittingly sponsor a biased report. It is unfortunate that sometimes such organizations may be victimized by those trusted to guard their best interests.

CHAPTER 16

METRIC PROGRESS IN 1922

The year 1922 has opened auspiciously for the cause of world metric standardization. Thruout the United States of America, and thruout the world, widespread interest is manifested in the advance to metric units—meter-liter-gram. In the closing chapter of this book, therefore, record will be made of the world events having bearing upon this movement, up to the time of going to press.

Great Year For Metrics

Recent cable advices have brought fuller details of the advance by many nations to the decimal metric units, instituted in 1921. In that year Japan, Russia, Poland, Latvia, Esthonia, Lithuania, Siam, China, and other countries confirmed their adoption of the world standards, thru legislative enactments. Probably in no other era (not even in the decade 1861-1871) have there been such great accessions to the ranks of the nations committed to use of the world units in all commercial transactions. In the years 1920-22, countries with a total population of 300,000,000 have definitely adopted the metric units; and during that period, China, with 400,000,000, has kept up the process by which it is gradually advancing to the metric units in merchandising and industry.

It should be noted that wherever obsolete weights and measures are abandoned, the metric units invariably replace them. The cumbersome antique jumble of weights and measures which the English-speaking peoples so far have tolerated to their own great detriment, has found no adherents among the nations. It has few apologists anywhere; and on every hand it is losing ground. This book has reviewed the rapidly-growing movement thruout the United States of America for legislation putting metric units into exclusive use for merchandising. It is recognized that in a short time, probably during the present Congress, the United States of America likewise will advance to metric standardization with the world. And when that comes about, even if the British continue to lag, the so-called "British" system (it is really of German origin) will have few more adherents thruout the world than the obsolete British coinage system of pounds, shillings and pence. Whereas the metric units will be employed exclusively by 900,000,000 people, the "German-British" units would

then (at the worst) be retained by scarcely 60,000,000—all within the "British Commonwealths"—less than 4% of the world's people. In view of this, it is likely that progressive Britons will soon win in their insistence that British commerce shall employ the efficient trade-getting metric units, in order to avoid the imminent danger of being left in utter isolation with obsolete weights and measures. The outlook for all the world to be using the uniform metric basis within a few years is indeed bright. In fact, it is inevitable.

World Cables Record Metric Advance

Hundreds of newspapers thruout the United States printed the dispatch of the Public Ledger Cable Service, dated Paris, 14 March, 1922, commenting on the metric advance: "A report from the World Bureau of Weights and Measures on the 'peaceful penetration of the metric system' shows a gradual world-wide adoption of the decimal method. . . . It is remarked that it is only Anglo-Saxons which use the old method. The report expressed hope that a bill proposing the metric system for the United States will be adopted by Congress."

Newspapers in February, 1922, printed this dispatch: "In **Russia,** the old weights and measures are being changed to the metric in the machine shops, railroads and drug stores. This can be easily done since all industrial and commercial operations are under government management. The people will not find the change difficult because the old unit of weight, the pood, is almost exactly 16 kilograms, and the verst is only 1/15th more than a kilometer. A Russian peasant is never so exact as that in his estimate of distances. The action of Soviet Russia leaves only the United States and the British Empire outside the international metric system."

A news dispatch published in various journals in March, 1922, states: "The **Lithuania** bureau of weights and measures has announced that the use of the various Russian systems of weights and measures will be abandoned and that the use of the metric system of weights and measures will be required in Lithuanian commercial and industrial establishments. While its use is not obligatory upon foreign imports, it is preferable that shipments to Lithuania be marked in metric units so far as possible."

In March, 1922, also comes news that **Esthonia** has adopted the metric units, so that there is now no country tolerating the antique Russian units. The antique, diverse "British" units are not in favor in **Ireland**; and news dispatches from Dublin, 1922,

carry the assurance that the Irish Free State is to adopt the world metric units and decimal coinage.

Germany's Standardization Program

An important report on "Industrial Standardization in Germany" has been published by **P. G. Agnew,** Secretary of the American Engineering Standards Committee. He declares: "Insufficient attention has been given to the role which standardization is playing in German industrial reconstruction. The German industries are planning and are carrying out a far-reaching program of standardization as a necessary step in building up an unprecedented industrial structure which must rest in large measure on an extensive foreign trade. . . . The continental countries are going much further into dimensional standardization than are the Anglo-Saxon countries. This includes interchangeability of supplies and of machine elements. . . . German manufacturers will go farther in yielding apparent temporary commercial advantages for the sake of advancing their national industry as a whole, than is the case in America or Great Britain." (See "Mechanical Engineering," February, 1922.)

Commenting on this report, the "American Machinist" says editorially: "Standardization should be studied from all angles. . . . Private and selfish reasons must not stand in the way of reducing costs in the use of machines and machine parts, even if it means wiping out some of our existing practices. . . . Practices which are simply the result of accident or of tradition should be eliminated. . . . In any case we should bear in mind the effect on the industry, or the country as a whole, and not on the particular individual who may be affected adversely."

Lack of Metrics Great Peril

In reference to the standardization program of Germany, and its bearing on world trade and world war, Captain George P. Blow, eminent manufacturer, declared (22 November, 1921): "In 1914, just before the World War began, I made a voyage down the Eastern coast of South America; and passing thru the Straits of Magellan, up the Western coast, and thence home *via* Panama. I took pains to study the trade conditions on both the Atlantic and Pacific coasts, and returned convinced that the principal (if not only) reasons why the Germans were driving out American and British goods, of a better quality than those they supplied, was because the GERMANS and SOUTH AMERICA both bought and sold, advertised and talked, the same trade language—**'Metrics'**; while we had to translate into a system they had rejected and long ago forgotten.

"I was called before the (then new) Federal Trade Commission, in Chicago, and gave my opinion and conviction to this effect. Since that date, the world has been thru the greatest war in history; 4 years of death and destruction and misery. One of the very first things done was to adopt the metric system, by both England and America for all war purposes, including making of arms and munitions. **And it is my honest belief that the Allies could have crushed their enemies A YEAR EARLIER and saved hundreds of thousands of lives, and billions in money, if this change had been made even 5 years before 1914. In fact, it is doubtful if the war would have begun."**

In view of the world situation, with Germany and other metric nations assailing our trade position in Latin America and the Orient; and with possibility of world conflict within this decade, this statement takes on added significance. Lack of world metric standardization is to the United States of America **a grave national peril.** Let it never be forgotten that Japan, Russia, Germany and all other nations except the British are now standardized on the world metric basis.

World Chamber of Commerce

Great interest is being displayed thruout the world in the question of world standardization. This was shown by the statements of the leaders of all the national delegations at the Washington Conference on the Limitation of Armaments; they were strongly in favor of the metric units. (See pages 186-189.) As has been indicated in earlier chapters (See page 108), the International Chamber of Commerce has interested itself in this whole subject.

In a report on "Standardization" issued by the International Chamber of Commerce, M. Lemaire, Secretary General of the French permanent Committee on Standardization, has urged a world standardization technical organization. "A well-informed, independent and sufficiently powerful international organism," he says, "would alone be fitted to undertake the work with the necessary impartiality and breadth."

An American Committee on Standardization has been appointed by the International Chamber of Commerce, 1922. The distinguished personnel of this committee is as follows: George P. Blow (Chairman), President, Western Clock Company, LaSalle, Illinois; P. G. Agnew, Secretary, American Engineering Standards Committee, New York City; Edgar Carolan, International General Electric Company, Paris, France; Charles F. Lang, President, Lakewood Engineering Company, Cleveland, Ohio; Alfred Reeves, General Manager, National Automobile Chamber of Com-

merce, New York City; C. L. Warwick, Secretary, American Society for Testing Materials, Philadelphia, Pennsylvania.

The International Chamber of Commerce meets in Rome, Italy, in the autumn of 1922. It is expected that this great convention will take further decisive action for the unification of the weights and measures of the world. Most of the countries holding membership are already on the world metric basis, and are eager for complete world standardization.

Chamber of Commerce of United States

In the United States of America there has been great interest displayed in world metric standardization by commercial organizations. The Chamber of Commerce of the United States has considered the subject of such far-reaching importance that at a meeting of the National Council, at which several hundred delegates were present, metric standardization was one of the 2 principal topics discussed. This meeting was held in Washington, D. C., 9 February, 1922, to consider the Report of the Special Committee on the Metric System. Among those who participated in the discussion in favor of the world metric units were Howard Richards, George P. Blow, Charles L. Parsons, Harvey W. Wiley, and others. Edmund D. Fisher, Chairman of the Metric System Committee, urged that a Referendum vote of the Chamber of Commerce of the United States should be held on this subject, and pointed out that the Committee is unanimous in its recommendation that the matter should go to Referendum. "If this body should recommend that the subject be dropped," he declared, "you would be taking a step backward."

Despite frantic efforts of obstructionists to have the metric discussion dropped, it was decided by the meeting that the subject is one of vast importance to the United States of America, deserving of full consideration. Because of the unusual status of the country, then existing, it was deemed advantageous to defer for a time the nationwide Referendum called for. "The National Council suggests to the Board of Directors that, as the existing business conditions are not such as to secure a sympathetic consideration of the subject (world metric standardization), the report should not be immediately submitted for a Referendum vote but should have consideration from the Board at a more opportune time."

Metric advocates have noted with satisfaction that the National Council of the Chamber of Commerce of the United States has gone on record urging further consideration of metric standardization, and has expressed the desire for sympathetic consid-

eration of that subject. Nevertheless, despite the promise of future action, there is a widespread opinion amongst business men that the time for action is **now**, and that the Metric Referendum should be called forthwith. As one practical observer has said, in reference to the metric advance: "The timid ones cry out, '*At this time,* we mustn't even talk about it!' Business conditions are alleged as a bar to discussion. Yet Japan, in the midst of a most terrific depression, has had gumption enough not only to **talk** about it, but to **do** it. Russia, in the most unsettled period of her history, took the final step to metric standardization. And all this has happened within the present business year: 250,000,000 humans have thus actually in this one year made the metric advance; yet a few seek to stay us by pleading that our 100,000,000 should refrain from even considering the advance, **at this time.**"

Metric Referendum in Prospect

The meeting of 9 February, 1922, indicated the strength of the metric advocates in that they are eager for a nationwide Referendum on the adoption of the decimal metric units for the United States. The opposition, on the other hand, betrayed their weakness and their fear, for they openly and secretly fought the submission of the Metric Referendum to all the member organizations of the Chamber of Commerce of the United States—seeking to stifle discussion of this vital issue. There can be but one interpretation of their desperate tactics of obstruction. The opposition realize that they represent only a minority, and that their weakness would be revealed by a nationwide vote of business men.

Urging a Referendum, and disclosing the motives of those opposed to it, Hon. **William B. McKinley,** United States Senator from Illinois, has written: "It seems to me that sufficient interest has been shown in the 102,000 metric petitions on file with the Department of Commerce, the favorable endorsement of over 100 recognized national organizations, and the expression of over 200 member organizations of the Chamber of Commerce of the United States of America in favor of metric standardization, to warrant an immediate decision on the part of the Board of Directors of the National Chamber to hold a metric referendum.

"Do you suppose that those opposed to the change **fear** the result of such a referendum and have tried to influence certain members of the Board against it?"

Despite the efforts of obstructionists to smother discussion, hundreds of Chambers of Commerce have been considering this vital improvement; and recently such important organizations as the Brooklyn Chamber of Commerce and the Kansas City Chamber

of Commerce have urged the calling of the nationwide Metric Referendum. Now that business conditions have altered for the better, it is considered that no further excuses will be tolerated, and that the unanimous recommendation of the Metric System Committee of the Chamber of Commerce of the United States of America will be carried out.

Metric System Committee Report

The report of that Committee has been published in pamphlet form, and distributed to member organizations of the Chamber of Commerce of the United States. It has resulted in widespread interest in the metric advance, and has led to many special articles such as that which appeared in "The Nation's Business" (March, 1922), "America and the Metric System." All this discussion has resulted favorably for the metric cause.

The Referendum Pamphlet, "Advice to Directors Regarding Metric Referendum," shows that the Committee (while divided on the subject of the metric advance) believes that "A uniform world-wide system of weights and measures, like a world-wide language, is admittedly desirable." The **Unanimous Recommendation** of the Committee, in conclusion, is: "Therefore, in order to ascertain sentiment on the issue thus presented, it is recommended that a Referendum be had upon the following proposition: '**That legislation be favored that would provide for the abandonment of our present system of weights and measures and for the adoption of the metric system as the sole standard of weights and measures in the United States, except where exemption from such use may be granted by designated authority; provided, however, that there be an optional period of 10 years for education and preparation.**'"

In the pamphlet, a summary of the arguments on both sides is given. The pro-metric brief is in the main a masterly production. Commenting on this Affirmative argument, a leading metric advocate recently said, "This is the best ever in 140 years; and it's an unique honor for the Human Family to be blest with this summary of trainloads and shiploads of material into a Brief such as this fine work."

The Negative contention is full of loopholes, and its general trend is similar to that of the "report" reviewed in the preceding chapter. It even reproduces much of the material from that report, on which it is admittedly based; so that further comment at this point is unnecessary. For a reason hard to discern, the "Table of Linear Measures Corresponding to the English Foot" is placed at the conclusion of the negative case; but with no state-

ment that these are **dead units,** scrapt long ago by all the nations that once used them. (See page 501.)

All Agree on Liter and Gram

Even the "Anti-Metric" contention has to admit (page 21): "The change would be **comparatively easy** as to a system of money, of **weights,** or of **measures of volume.**" This being the case, since all are agreed upon the ease of transition to the world units of weight and volume—the **gram** and the **liter**—the advance ought to be made forthwith, by unanimous acclaim. Then we can set about a consideration of the **meter,** also, and find out ways to institute that world unit, for the benefit of all and the injury of none. It surely can be done in the United States of America as it has been done successfully in so many other countries. In the meantime, we should not forget that very few (not even most of the opponents of the **meter**) make objection to adoption of the liter and the gram.

It is to be regretted that the Metric Committee report is not upon the definite proposal before Congress (the Britten-Ladd Bill), but **Ben C. Dailey,** one of the members of the Committee calls attention to that pending legislation in a special note in the Committee Report. He also directs notice to the 103,000 prometric petitions before Congress, representing millions of voters. He states that "the population of countries now officially committed to gradual adoption of the metric units outnumbers those using British units **at least 3 to 1.**" It is believed that when the Metric Referendum is called in the near future by the Chamber of Commerce of the United States, it will have particular reference to the legislative proposal **now** before Congress.

Metric Hearings In Senate

The Metric hearings have continued in the Senate. Much of the anti-metric testimony which has been placed before the Senate Committee holding hearings on the Britten-Ladd Bill has little reference to **that** concrete proposal, but instead seeks to refute a proposal which was never made, involving alleged "wholesale scrapping of machinery." On the basis of this false theory of destruction, the anti-metric propagandists have put forth fanciful estimates of tremendous losses, and in this way they have misled a number of associations to "resolve" against the metric units, on the pretense that the metric units are to be imposed upon industry in processes of production. Virtually all of the resolutions presented to the Committee by the anti-metric lobby were dated in 1919 and 1920, **before** the introduction of the Frelinghuysen, Britten and Ladd Bills, when of course it was more easy to misrepresent

what is actually proposed by the metric advocates—who aim only at the exclusive use of the world metric units in **merchandising,** with manufacturers continuing to employ whatever units they desire in production.

Analysis of the anti-metric contentions before the Senate Committee shows that very few of the obstructionist witnesses were able or willing to stay on the question, but wandered off into the theoretical realms of "what might be proposed." This made the bulk of anti-metric testimony utterly beside the point, and such arguments as did have bearing on the Britten-Ladd Bill were amply refuted in the pro-metric rebuttal. The main aim of the anti-metric organized opposition seemed to be to **bewilder** the committee with a mass of unrelated details, mostly in the form of interminable "briefs."

The metric hearings before the Senate Committee have continued into the spring of 1922, and it is expected that during the year hearings will also be called before the House of Representatives **Committee on Coinage, Weights and Measures.** Enactment of a metric standards law by the present (67th) Congress appears assured.

Radio and the Metric Units

The remarkable nationwide (and worldwide) spread of interest in Radio telegraphy in 1922 has served to call attention to the fact that **Radio** —like virtually every modern development—is entirely on the world metric basis; and vast publicity has been given this fact in newspapers and periodicals. Thousands thruout the United States of America have become familiar with the measurement of "wave-lengths" by the meter; and these thousands have gained a complete understanding of the truth uttered by Arthur E. Kennelly: "From the moment that a wireless key is closed at one point on the earth's surface to the moment when the outgoing invisible electric wave arrives at the opposite side of the globe, is a little more than a 15th of a second. Only the Metric System can possibly survive on a 15th-of-a-second-globe." (See page 29.)

Washington Metric Workers Organize

To aid in securing adoption of metric standards legislation, a powerful section of workers for the metric units was organized at Washington, D. C., on 10 March, 1922. Senator E. F. Ladd addressed the meeting, stressing the importance of the metric system. "Its use should be encouraged in the public schools, and in the government, home and factory." The Washington "Herald" states, "He spoke of an amendment to his bill which would provide that in 1926 **all Government specifications and engineering work** be done

with the use of the metric system. In this manner, Senator Ladd stated, he hopes to bring the system before the nation for universal use."

Officers of the Washington metric section were elected as follows: President, E. J. Henning, Assistant United States Secretary of Labor; Vice-President, G. F. Weeks, editor of "The Mexican Review"; 2nd Vice-President, Dr. H. L. Hodgkins, Dean of George Washington University; Secretary and Treasurer, W. Peters. The Executive Committee consists of Dr. Harvey Wiley, chairman; John Barrett, S. J. Macfarren, Dr. C. L. Parsons, and Stephen Kramer, Assistant Superintendent of Schools. Frederic L. Roberts, Washington representative of the American Metric Association, works in close co-operation with this section, of which he is a member. As the result of the establishment of this effective unit of workers, it is expected that the subject of world metric standardization will be placed even more prominently before national legislators.

A Call To Action

The great progress which world metric standardization has made thruout the United States of America and thruout the world, especially in 1921 and 1922, is summarized in a splendid article by Senator E. F. Ladd, in the "New York Commercial," 21 February, 1922. Senator Ladd concludes that article with a paragraph which may appropriately serve as a conclusion to this book, and as a call to action:

"Now that there is so much interest aroused in the metric advance, it behooves all those who have the cause at heart to lend a helping hand until the American people are freed from the bondage of an archaic system of weights and measures."

INDEX

This Index includes the principal topics considered in this book, and the principal authorities cited. It is comprehensive, but not all the authorities quoted in these pages could be here listed, since they number many thousands of individuals, organizations, and commercial and industrial concerns. The reader is urged to use the Cross-Index citations, especially with reference to the different trades and vocations. The various Countries of the world are listed separately, and also in groups, as "Africa, Asia, Europe, Latin America, Orient," and so on. It is trusted that the reader will make full use of this Index, for it will aid greatly in rendering this book effective, and will give a comprehensive view of "World Metric Standardization: An Urgent Issue."

A

Abbott, W. L., 457
Accountancy, 158, 217, 218
Adams, Comfort A., 12, 119, 171, 215, 338, 469
Adams, John Quincy, 151, 185, 448, 452, 488
Advisory Committee for World Metric Standardization Council, 119, 120
Africa, 36, 357, 359, 361, 407, 436 (See also Map pages at front of volume.)
Agassiz Association, 73
Agriculture, 69, 158, 168, 170, 176, 177, 190, 224-230, 241, 266, 309, 322, 323, 326, 366, 380
  Associations, 98
  Bloc, 164, 165, 224
Aids to metric use, 131, 134, 135 (For Bibliography, see Chapter 14.)
Akron Chamber of Commerce, 89
Alexander, J. W., 263
Allcock, Harry, 11, 131, 132, 136, 296, 300, 301, 302, 317, 318, 330, 347, 355, 356, 419, 441, 444, 470, 471 (See also Title-Page.)
Allied Chemical and Dye Corporation, 189
Allies using metrics, 19, 20, 426 (See also World War.)
Alsberg, C. Lucas, 12
American Academy of Medicine, 62, 72
American Association for the Advancement of Science, 62, 70
American Association of Engineers, 80
American Blower Co., 194
American Bosch Magneto Corporation, 198
American Chemical Society, 58, 59, 62, 127
American Electro-chemical Society, 62, 74
American Federation of Labor, 76, 82
American Institute of Architects, 60, 75
American Legion, 80, 97
"American Machinist," 217, 506
American Medical Association, 62, 72
American Medical Trade Association, 61, 66
American Metric Association, 9, 54-57, 177, 180, 355, 436, 439-441, 471
American Metric Bureau, 447
American Pharmaceutical Association, 58, 61, 67, 167
American Society for Testing Materials, 61, 73
American Society of Equity, 61, 69, 225
American Specialty Manufacturers' Association, 60, 67
American Woods Export Association, 61, 68
Apparel trades—See Clothiers, Millinery, Shoes, Textiles
Arabic numerals, 38, 39, 125
Architects, 60, 75, 86, 215, 216
  British, 381, 382
Argentine, 112, 270, 365, 410, 460
Army and metric standardization, 123, 124, 138, 139, 174, 175, 184, 231-233 (See also World War; Navy.)
Arnold-Forster, H. O., 333, 334, 447
Arnold, John J., 10, 121, 139
Arny, H. V., 12, 247, 471
Articles, Select, 403-438 (For Bibliography, see Chapter 14.)
Artillery—See Army; World War
Artists, 253
Asbestos Association, British, 364
Asia, 81, 469 (See also Orient; China, Japan and other countries.)
Asia Minor, 469
Askew, Francis, 363
Associated Chambers of Commerce of the British Empire, 42
Association of American Steel Manufacturers, 68
Athletics, 97, 98, 310
Atlas Ball Co., 196
Attorneys, 98, 158, 237-240
Aughinbaugh, W. E., 34
Australia, 37, 356, 358, 407, 443
Austria, 298, 315, 406
Authors, 82, 251-253 (For Bibliography, see Chapter 14.)
Automatic Electric Co., 166, 195
Automobile industry, 192, 193, 198, 202, 214, 373 (See also Ford; Haynes; Goodyear; Manufacture.)
Avebury, Lord, 356
Aviation, 29, 30, 194, 203, 233, 239, 426

B

Babson, Roger W., 12, 172, 185, 218
Bacon, Raymond F., 12, 119
Bailey, R. C., 12
Baker, Newton D., 264
Baldwin Locomotive Works, 190, 289, 290 (See also Vauclain, Samuel.)
Balfour, Arthur James, 187, 461, 486
Bankers, 109, 184, 185, 234-236
British, 362, 374-380
Barker, A. F., 303, 305, 441
Barnard, F. A. P., 447, 472
Barrett, John, 36, 185, 436, 513
Barrows, David Prescott, 244
Baxter, P. P., 263
Bayer, H. G., 338, 347, 447
Bearce, H. W., 170
Beech-Nut Packing Co., 197
Beekeepers, 86
Belgium, 112, 116, 188, 202, 203, 270, 401
Belhaven and Stenton, Lord, 356
Bell, Alexander Graham, 12, 182, 316, 321, 336, 338, 349, 436, 456, 472
Bell, Louis, 299, 316
Benedict, A. L., 346
Benson, Admiral, W. S., 35, 183
Berkeley Chamber of Commerce, 90
Bertschy, A. J. P., 204
Best & Lloyd, 337
Bible quoted, 24
Bills, Metric Standards—See Legislation
Bingham, Eugene C., 11, 59, 119, 166
Blaine, James G., 157
Blair, Mathew, 304
Blow, Captain George P., 11, 119, 176, 202, 330, 506
Board of Trade Journal, 424
Boards of Trade, 88 (See also Organizations.)
Bogart, F. H., 297
Bolles, Frank G., 233, 344
Booklets, Metric, 46, 444-446
Books and Pamphlets, 439, 452
Boot and Shoe Manufacturers, British, 364
Boston Chamber of Commerce, 88
Bradford Technical College, 303
Brady, J. B., 190
Brady, Matthew, 239
Brashear, John A., 213
Brazil, 113, 410, 413, 414, 461
Briand, Aristide, 187
Briggs, E. R., 302, 341, 344, 473
Brisbane, Arthur, 252, 313
Briscoe Motor Corporation, 192
Britannia, 18, 180, 353-402 (See "British.")
British Commonwealths, metric movement in, 37, 42, 187
British House of Commons, 22, 47, 354
British House of Lords, 22, 355
British Isles, 131, 142, 180, 459-469
British objections to decimal system, 40
British Parliament, 353, 443
Parliamentary Committee Metric Report, 1862, 151, 152, 178, 387-402, 468
Parliamentary Reports, Accounts and Papers, 445, 467-469
Undecimalized coinage, 18, 40, 257
Britons, Eminent, 370-374
Britten, Fred A., 13, 161, 162, 264
Britten-Ladd Metric Standards Bill, 59, 162-179, 230, 459, 499, 502, 511
Bronx Board of Trade, 88
Brown, Albert F., 263
Brown, E. N., 190
Bryan, William J., 185
Bryce, Viscount, 371
Building industry, 76, 78, 95
Bull, Sir William, 371
"Bulletin," San Francisco, 435
Burbank, Luther, 11, 119, 182, 230
Bureau of Standards, 157, 177, 307, 425, 495
Burleson, A. S., 264
Burpee & Co., W. Atlee, 227
Business Clubs, British, 364
Business Organizations (See Organizations.)
Butler, Nicholas Murray, 184, 430

C

Cabot, Godfrey L., 203, 350, 474
Caillard, Sir Vincent, 373
Cain, James W., 191
Cajori, Florian, 246
California, 159, 262 (See also World Trade Club.)
California Wire Cloth Co., 199
Canada, 19, 47, 143, 356, 365, 366, 380, 409, 415, 427
Canners—See Packers; grocery trade
Cape Colony, 356
Capper, Arthur, 164, 230
Carnegie, Andrew, 37, 38, 44, 185, 302, 436, 446, 448 (See Frontispiece.)
Carnegie Committee Metric Report, 38-44, 444
Catholic Welfare Council, National, 77
Catholic National Council of Women, 77
Catlin, R. M., 343, 345
Catt, Carrie Chapman, 245
Centigrade thermometer, 258
Central Powers used metrics, 426 (See also Germany.)
Chamberlain, Arthur, 290, 300, 325
Chamber of Trade, National British, 362

Chambers of Commerce, 88-106
Association of British, 360
British, 365, 390
Chamber of Commerce, Montreal, Canada, 366
Chamber of Commerce of the United States, 17, 501, 508
Member organizations, 99-104
Metric referendum, 17, 52, 57, 508-511
Conference of Irish, 360
Of the British Empire, Congress of, 353, 358
Chapman, H. L., 337
Chase, Salmon P., 151
Cheating with confusing units, 266, 327, 336
Chedville, D., 303, 442
Chemical industry, 58, 59, 62, 74, 127, 156, 166, 168, 170, 189, 190, 200, 308
Chester, England, 363
Chevalier, Michel, 387, 398, 401
Chicago Board of Aldermen, 161, 170, 262
Child Conservation League of America, 82
Child Welfare Association, National, 77
Chili, 410, 467
China, 36, 139, 167, 171, 188, 242, 246, 256, 312, 313, 436, 448, 462, 465, 498, 504
Christian Science Monitor, 255
Christianson, A., 193, 214
Churches, 240-242
Clark, Champ, 186
Claxton, P. P., 243, 475
Clemenceau, Georges, 270
Clergy, 240-242
Clothiers, 65, 259
Cobden, Richard, 397, 453
Cody, Sherwin, 253
Coinage, decimal, 22, 40, 135, 149, 349, 404, 407, 442 (See also Jefferson.)
Coinage, undecimalized—See British Isles
Collins, Joseph V., 12, 24, 126, 248, 309, 320, 326, 327, 335, 336, 345, 348, 427, 433, 474, 475
Colombia, 116, 459
Commercial organizations, 86, 87, 88-106, 367
Commercial travelers, 85, 362 (See Mobile Merchants.)
Commercial Union of America, 69, 173
Committee on Coinage, Weights and Measures (U. S. America), 151, 156, 265, 453-457
Communication — See Railroads; Radio; Aviation; Postal; World Trade; Language
Complexity of weights and measures —See Loss
Concurrent action by America and Britain, 134, 135, 136
Confusion of weights and measures—See Loss
Congress of the United States, 16, 148, 230, 262, 354 (See Legislation.)
Connell, Alexander T., 264
Consular reports, 157, 412-415, 459-467
Consuls, 266
Conventions of metric urgers, 55, 120-142
Cooper, F. E., 247
Copper Association, British, 365
Cost of metric standardization, 25-27, 273-352 (See Loss.)
Cotton trade, 90
Council of Commerce, British Imperial, 360
Councils, British, 369, 370
Town and County, British, 363
Countries using metric units, 36, 41, 49, 392, 412 (See Argentine, Brazil, and so on, each country listed separately.) (See also Map pages at front of volume.)
Crammond, Edgar, 327
Crane Co., 119, 177, 178, 189, 291, 492 (See also McEachren)
Crane, Dr. Frank, 252
Crawford, Hugh, 372
Crocker, W. Mortimer, 10, 118, 159, 176, 499, 502 (See also Title-Page)
Crane, R. T., Jr., 12, 189
Crowell, Benedict, 327, 346, 458
Cuba, 157, 313, 431, 459, 465, 484
Curtiss, Glenn H., 194
Customs Congress of the American Republics, 475

D

Dailey, Ben C., 9, 10, 52, 153, 170, 511
"Daily Herald," New York and Paris, 157, 254
Daily life, use of metric units in, 322, 323, 326, 327, 347-351 (See also Use)
Dalton Adding Machine Co., 206
d'Alte, Viscount, 189
Danner, E. C. 193
Darrow, Burgess, 12, 129
Davis, Hugh M., 263
Davis, N. A., 9, 10, 51, 261
Decatur, James G., 9, 136
Decimal Associations, British, 9, 42, 131, 355, 356, 441-443, 495
Decimal coinage, 40, 135, 149, 349, 404, 442
"Decimal Educator," 11, 295, 386

Decimal systems, 201, 417
Deland, Margaret, 251
De Laval Separator Co., 166, 193, 486
Delegates to World Metric Standardization Conference, 137-141
Demand for metric advance, 16, 53, 158; all of Chapter 6, 9, 11, and so on (See Petitions)
Denmark, 316, 435, 459
Denver Civic and Commercial Association, 88
Dewey, Melvil, 11, 119, 245, 326, 447
Diaz, Armando, 270
Dickerman, George W., 191
Dickman, Major-General J. T., 231
Didier, Paul, 152
Disarmament Conference, 186-189, 507
Diversity of weights and measures—See Loss; Jumble
Dominican Republic, 463
Dominions Royal Commission, 37, 360
Draftsmen want metrics, 350, 475
Drake, Major Fred R., 11, 57, 119, 308, 314, 440, 476, 489
Druggist trade urges metrics, 58, 61, 68, 79, 87, 98, 167, 204, 222, 223
Drury, Aubrey, 13, 50, 51, 52, 119, 136, 171, 403, 424, 425, 444, 476
Dry Goods, 259, 351
Dunn, Gano, 194
Du Pont, A. F., 12, 119, 204
du Pont de Nemours & Co., E. I., 190
Du Pont Food Products Co., 204
Dutch East Indies, 436
Dyers' Federation, Yorkshire, England, 364

E

East Indies, 357
Easton Board of Trade, 88
Eaton, Charles Scribner, 12, 119 (See Chicago Board of Aldermen)
Edison, Thomas A., 182, 246
Editors, 251-253
Education, 24, 95, 98, 158, 184, 191, 243, 252, 258, 320, 321, 322, 323, 326, 351, 352, 363, 383-385, 394, 420, 421, 433, 438, 474, 475, 502
Educational metric campaign, 46, 118
Educators, 98, 242-251
Edwards, George B., 372
Electrical industry, 62, 64, 74, 84, 166, 190, 195, 293, 308, 309, 311, 363, 491
Eliot, Charles W., 11, 25, 119, 184, 433
Eller, Morris, 170
Emerson-Brantingham Co., 190
Emmott, Lord, 371
Endorsements for metric standardization, 53-117, 180-272 (See especially Chapters 9 and 11)
Engineering, 62, 74, 79, 80, 158, 166, 167, 171, 172, 174, 213-219, 381, 382 (See also Manufacture)
Ernst & Ernst, 217
Errors reduced by metrics, 350, 351, 393
Esperanto, 132, 138, 262
Esthonia, 498, 504, 505
Europe, 257, 313, 410, 438, 469 (See also various Countries)
"Evening at the World Trade Club," 49-51
"Evening Mail," New York, 254
"Evening Transcript," Boston, 255
Ewart, William, 397, 453
"Examiner," Los Angeles, 254
Exemption of Manufacture — See "Scrapping of Machinery will not result"
Exhibitions, World, 390
Export—See World Trade

F

Fairbairn, Sir William, 398, 400
Fairbanks, Henry, 44
Falkland Islands, 357
Farming—See Agriculture
Farquhar, A. B., 196
Fawcett, Waldon, 33
Fay, Paul R., 12
Fellows, Frank Perko, 326, 398, 400, 401
Felt, Dorr E., 12, 172, 496
Finance—See Bankers
Finland, 498, 504
Fisher, Edmund D., 17, 508
Fletcher, Duncan U., 265
Foch, Marshal, 171
Foot, antique unit, 258, 447, 501, 510
Forbes, C. R., 267
Ford, Henry, 182, 189, 436
Ford Motor Car Co., 189
Foreign, objection to use of word, 48
Foreign Trade Club of San Francisco, 45, 48, 170, 171 (See World Trade Club)
Foreign Trade Convention, National, 69, 139-141
Forestry, 224-230
Foster, Sir George E., 371
France, 22, 40, 114-116, 136, 150, 171, 187, 228, 232, 246, 269, 270, 288, 316, 357, 388, 392, 413, 429, 431, 460, 464, 466
France, Joseph Irwin, 265
Franklin, Benjamin, 178
Frelinghuysen, Joseph S., 154, 155, 160, 161, 237
Frelinghuysen Metric Bill, 160, 161, 511
French Indo-China (See Indo-China)
Furniture manufacturers, 78

G

Gage, Lyman T., 157
Gages, 341-344 (See also Manufacture)
Galveston Cotton Exchange, 90
Gary, James A., 157
Gary, Judge E. H., 185, 436
German propaganda, 8, 47, 49, 152-156, 497
Germany, 18-19, 27, 34, 45, 111, 113, 128, 148, 152-156, 233, 298, 311, 314, 315, 316, 319, 354, 406, 408, 431, 463, 506, 507 (See also World War)
Gerrie, John H., 9, 30, 48, 435, 477
Gibbons, Floyd, 252
Gibbons, Herbert Adams, 252
Gibraltar, 357
Giraud, Gaston, 9, 136, 171
Glass distributors, 78
Glensor, H. W., 9, 10, 51, 237
Goldberg, Elias, 327
Gompers, Samuel, 12, 82, 185
Goodyear Tire & Rubber Co., adopts metrics, 129-131, 189, 295
Gore, J. H., 316, 332, 337, 477
Gorgas, W. C., 186
Gourdaine, M., 270
Grace & Co., W. R., 201
Greece, 116, 272
Greek prefixes, 23, 396
Greeley, William B., 228
Grocery business urges metrics, 57, 58, 85, 95, 169, 473
Growers—See Agriculture
Guiana, British, 357
Guillaume, C. E., 12, 296, 298, 317, 341, 478

H

Hadley, Arthur T., 184
Hagenaers & Co., Lionel, 202
Hague, William E., 9, 10, 50, 51, 52, 119, 403, 416, 417, 445
Hall, Winfield S., 12, 119
Hallock, William, 290, 291, 293, 341, 449
Hamilton, Alexander, 178, 449
Hamilton Watch Co., 196
Hammer, William H., 9, 10, 46, 50, 51, 52, 118, 120, 121, 403, 411, 412, 445
Hammond, John Hays, 185, 436
Hammond Lumber Co., 191
Hanseatic League, 18, 233, 248, 321, 428, 435
Harding, Charles H., 43
Harding, Warren G., 161
Hardware trade, 84, 201, 410 (See Manufacture)
Hart, Albert Bushnell, 185, 244, 436
Hartigan, Joseph, 350
Haskell, Lewis W., 413
Hauser, August, 478
Hawkeye Wrench Co., 202
Haynes, Elwood, 11, 165, 182, 193
Headmasters, British Association of, 362
Health, 266, 309 (See also Druggist trade; Medicine)
Hearings before Congress, 178, 165-179, 453-459, 511 (See also Legislation)
On the Ladd Metric Standards Bill (U. S. Senate), 57, 165-179
"Hearst's Magazine," 256
Henning, E. J., 513
Henriquez, George, 335
Henry, Guy A., 12
Herbert, Albert, 43, 48, 49, 119, 193, 356
Hildebrand, Clifton, 10, 439 (See also Title-Page)
Hilton, S. L., 12, 58, 167
Hindu-Arabic numerals, 3, 29, 38, 39, 125, 438
Hoare, L. L., 232
Hodgkins, H. L., 513
Holden, Sir Edward, 356, 372, 460
Holdsworth, J. T., 234
Holland, See Netherlands
Honduras, British, 357
Honolulu Chamber of Commerce, 36
Hoover, Herbert, 7, 336, 352
Hopkins, M. H., 196
Hord, John S., 168
Horner, E. D., 173
Housekeepers, 310 (See also Daily Life)
House of Commons, 47, 354
House of Lords, British, 355
Howard, Thomas, 12, 119
Hubbard, Henry D., 177
Humankind, advancement of, 8, 29, 30 (See Progress)
Humane associations, 82, 96
Hungary, 406
Huntington, Edward V., 12, 119
Hydes, C. E., 9, 10, 51, 236

I

Illinois, 93, 159, 262
Import—See World Trade
India, 357 (See also Asia, Orient, Hindu-Arabic numerals, and Map pages at front of volume)
Indo-China, 171, 436
Industry—See Manufacture
Inglis, James, 194
Insurance, 236, 237, 257, 267
Inter-American High Commission, Report to, 328, 329
United States Section, 29, 63, 109, 168, 169, 424, 463, 493

Interchangeability in manufacture, 33 (See Standardization, and Manufacture)
International Association of Rotary Clubs, 111
International Brotherhood of Electrical Workers, 76
International Chamber of Commerce, 108, 176, 507
International Conference of American States, 109
International Geneva Association of Hotel and Restaurant Employees, 110
International Metallurgical and Chemical Society, 63, 110
International 100% Club, 63, 112
International Red Cross, 63, 109, 136
International Trade Conference, 111
Inter-Racial Council, 81
Interrelation of metric units, 125, 126
Inventors, 27, 41, 75, 219-221, 239
Ireland, 47, 505, 506
Irish Chambers of Commerce, Conference of, 360
Italy, 94, 111, 113, 187, 266, 270, 431, 435

J

James, George Wharton, 253
Japan, 32, 36, 45, 167, 169, 187, 270, 271, 359, 436, 438, 450, 497, 498, 503, 504, 507, 509 (See also Asia, Orient, World War)
Jayne, Rear-Admiral J. L., 122
Jefferson, Thomas, 40, 149, 178, 185, 428, 449, 452
Jewelry trade, 77, 259, 310, 487
Joffre, Marshal, 136, 171, 269
Johnson, G. E. M., 11, 299, 304, 355, 356
Jones, Andrieus A., 165
Jones, John Paul, 175
Jones, J. R., 293
Jordan, David Starr, 185, 244
Jumble, present, causes great loss, 23-24, 171, 214, 238, 255-256, 258, 260-261, 287, 318-352, 389, 404-406, 410, 417 (See Loss)
Jurists, 98, 158, 237-240

K

Kahn, Julius, 164, 231 (U. S. Congressman from California)
Kahn, Julius, 192 (President, Truscon Steel Company)
Kahn, Lazard, 12, 193
Kahn, Otto H., 184, 436
Karpinski, Louis C., 12, 119, 480
Kato, Admiral, 187
Kaufman, E., 343
Keen, W. W., 177
Kellogg Toasted Corn Flake Co., 191
Kellogg, Vernon, 64
Kelvin, Lord, 28, 125, 298, 356, 442
Kemmerer, E. W., 247
Kennelly, Arthur E., 11, 29, 119, 153, 185, 214, 297, 330, 331, 349, 403, 404, 444, 446, 481, 512
Kenyon, W. S., 230
Kiwanis Clubs, 97, 98
Klein, Dr. Julius, 154
Kramer, Stephen, 513
Kunz, George F., 11, 55, 56, 119, 127, 299, 329, 347, 440, 459, 481
Kynochs, Ltd., 27, 290, 325, 432, 478

L

Labels in metric units, 57, 58, 127, 131
Labor, 76, 82, 83, 109, 110, 264, 266, 270, 372, 382, 383, 395, 396
Labor, saving in, 393 (See Loss)
Ladd, Edwin F., 13, 162, 224, 481, 512, 513
Ladd Metric Standards Bill, 166-179, 224, 263
Laggards, English-Speaking Peoples, 28, 407
La Guardia, Fiorello, 426
Landau, H. L., 337
Land surveys excepted, 170, 306
Lane, Franklin K., 157, 186
Language, development of, 38, 81
Of quantity, 38, 133, 420 (See Metric Units)
Lanman, Charles R., 47
Lansdowne, Lord, 355, 370
Lasker, Albert D., 35, 183
Latin America, 26, 34, 36, 109, 168, 169, 232, 255, 313, 319, 410, 411, 413, 414, 424, 436, 466, 469, 485, 498, 506 (See also Consular Reports; Pan-American; and the various Countries)
Latvia, 272, 498, 504
Lawyers, 98, 158, 237-240
League of Nations, 63, 259, 271
Le Conte, J., 482
Leeds & Northrup Co., 299
Lefelure, Victor, 155
Legislation, metric, 118, 147, 148-179, 224, 237, 262-269, 345, 348, 422, 423, 452-459, 511, 512 (See also Hearings)
Lehmer, D. N., 247, 350
Leonard & Sons, Ltd., 291
Levi, Leone, 398, 400, 401
Lewis, Clancey M., 11, 119, 128
Lewis, E. P., 220
Lewis, O. L., 202, 340
Libraries, 245, 310
Liggett, Lieutenant-General Hunter, 124, 185
Lincoln, Abraham, 151
Lind, John, 34, 267

Liondale Bleach, Dye & Print Works, Inc., 196
Litchfield, P. W., 189
Literature Clues, World Metric, 439-495
Lithuania, 498, 504, 505
Littauer Bros., 207
Local organizations, 84-108
Locke, Miss Bessie, 12
Locomotives, 26, 190, 289, 290 (See also Vauclain; Baldwin)
Lodge, Sir Oliver, 356, 373
London, Court of Common Council of the City of, 363
"Look It Up," 439-495
Lorrain, Leon, 12, 355, 366
Los Angeles Chamber of Commerce, 37, 88
Loss from lack of metric standardization, 33, 34, 318-352, 388-390, 404-406, 427, 428, 431, 445, 483, 500, 501
Lovering, William C., 265
Lubbock, Sir John, 356
Lucey Manufacturing Corporation, 196
Lumber trade, 61, 68, 85, 191, 294
Lunde, T. H., 348

M

Macfarren, S. J., 167, 513
Machinery, no scrapping of, 406 (See Manufacture)
Machine-tools, 204, 206, 287, 288, 393 (See Manufacture)
MacIlwaine, I. B. S., 47
Macnamara, T. J., 371
Madison, James, 150, 178, 185
Magna Charta, 388
Mailloux, C. O., 350
Malta, 357
Manchester, England, 363
Manufacture, 7, 26, 38-44, 56, 57, 60, 64, 65, 67, 84, 85, 93, 94, 100-106, 128, 129, 136, 158, 165, 166, 172, 176, 177, 189-213, 295-302, 322, 323, 325, 374-380, 512 (See especially Chapter 10, "What Will Metric Standardization Cost?")
Manufacturers, National American Association of, Metric Committee Report, 38-44
Maps in metric units, 174, 233, 351
Map showing worldwide use of metric units (See Map pages, front of volume)
Marchienne, Baron E. de Cartier de, 188
Marcil, Charles, 47
Martin, A. J., 289, 318, 333, 334, 351, 356, 450
Mauritius, 357
Maxim, Hudson, 185
Maxim, Sir Hiram, 443
Mayo, Dr. Charles H., 222
McAdoo, William G., 11, 30, 47, 152, 172, 182, 264, 437
McCarthy, C. J., 263
McEachren, Justin W., 11, 177, 293, 350, 482, 483
McGraw, James H., 352
McGuire, Constantine E., 11, 168
McKay, Alexander H., 12
McKenna, Reginald, 371
McKenna, Theodore, 356
McKinley, William B., 509
McNary, Charles L., 165
Medicine, 61, 62, 66, 72, 73, 86, 98, 158, 173, 177, 222, 223
Meeker, Royal, 266
Members of World Metric Standardization Council, 118-120, 142-147
Memorials to Congress, 159 (See also Petitions)
Mendenhall, Thomas Corwin, 12, 215, 454, 455, 483, 484
Merchandising, 7, 189-213, 295, 318, 374-380, 499, 512 (See also World Trade)
Meredith, E. T., 224, 229
Merrill, Joseph F., 12, 120, 216
"Metergram," 46, 446
Meter-Liter-Gram—See Metric Units
Metric booklets, 444-446 (See Chapter 14 thruout)
Metric Procession, 446
Metric Standards Bills—See Legislation
Metric Units—See thruout Book, especially pages 1, 7, 21, 353, 417, 429
Mexico, 34, 113, 168, 190, 253, 267, 413, 460, 461, 463
Military—See Army; World War
Miller, Fred J., 11, 172, 217
Miller Rubber Co., of New York, 190
Miller, T. H., 11, 166, 193, 289, 486
Millinery trade, 78
Milling industry, 293, 294
Mining, 110, 185, 322, 323, 326
Missionaries, 240-242, 246
Mobile Merchants, 85, 362, 438
Molesworth, Sir Guilford L., 356
Molitor, David A., 12, 120, 167, 348, 487
Montagu, Sir Samuel, 356
Moore, John Bassett, 172, 182
Morgan Drug Co., 204
Morris & Co., 190
Morris, Gouverneur, 149, 150
Mothers and Parent-Teachers Association, National Congress of, 98, 243
Motion picture industry urges metric standardization, 60, 64, 192, 260

Munitions of war—See World War; Crowell; Army
Munson, Frank C., 196
Music Industries Chamber of Commerce of the United States of America, 66

N

National Industrial Conference Board Report, 496-503
National American organizations urging metric standardization, 59-62, 64-83 (For British organizations, see Chapter 11)
National Research Council, 64
Navy and metric standardization, 122, 123, 173, 183, 231-233
Nelson, C. C., 265
Netherlands, 94, 188, 271, 357, 396, 414, 435, 462
Committee for Standardization, 335
Neville, Major-General Wendell C., 231
New Orleans Association of Commerce, 87
Newspapers, 254-262
"News-Tribune," Detroit, 255
"New York Commercial," 34, 513
"New York Herald," 157, 254
"New York Sun," 254
New Zealand, 37, 356, 358, 359, 407
Nichols, William H., 189
Nivelle, R., 269
Nixon, Lewis, 457
Noble, Sir Andrew, 373
Norman, Sir Henry, 371
Norris, G. W., 230
Norris, Miss Amy, 12, 366
Northcliffe, Lord, 356, 373
North Dakota, 159, 262
North, S. N. D., 458
Norway, 461
Noyes, William A., 12, 120
Nurses, 73, 86
Nymans, E., 335

O

Oakland Chamber of Commerce, 88
Obstruction to metric advance, 47-49, 148, 152-156, 496-503 (See also Persecution, Propaganda)
Official Documents, 452-459
Officials, 158, 262-269 (See Congress)
Opticians and Oculists, 62, 66, 310
Ordnance—See World War; Army
Orient, use of metric units in, 36, 45, 240, 319, 436 (See various Countries listed separately)
Organizations, British, 358-370
Organized effort for world metric standardization, 53-117, 137-147

P

Pacific Coast organizations, 36, 45
Pacific on metric basis, 36, 45 (See various Countries)
"Pacific Ports" magazine, 33
"Packer" magazine, 343
Packers, 98 (See grocery trade)
Page, R. H., 292
Painters and decorators, 86
Panama, 313, 431
Pan-American Commercial Conference, 457
Pan-American Federation of Labor, 63, 109
Pan-American Financial Conference, 63, 109, 457
Pan-American Union, 36, 63, 110, 185, 433, 436, 513
Paraguay, 467
Parker, Sir Gilbert, 371
Parliamentary Commercial Conference, International, 359
Parliamentary Committee, 1862, British, 354, 386, 387-402
Parliamentary Reports, British, 445, 467-469
Parliament, British, 353, 443
Parsons, Dr. Charles L., 11, 58, 59, 170, 352, 508, 513
Payne, John Barton, 35, 183
Peace (See Clergy; Religious organizations; Humane associations; Disarmament Conference; World War losses)
Peck, E. E., 174
Periodicals, 254-262, 469-495
Perkins, George W., 185, 436
Perry, Bliss, 251
Persecution of metric urgers, 8, 47, 49, 116, 152-156 (See also German Propaganda; Obstruction)
Pershing, General John J., 184 (See also World War)
Peru, 168, 410, 464
Petain, Marshal, 136, 171, 269
Peters, W., 513
Petitions to British Parliament, 46, 355
Petitions to Congress, 46, 54, 148, 157, 158, 159, 160, 487, 509, 511
Pharmacopoeia in metrics, 464
Pharmacy (See Druggist trade)
Philippine Chamber of Commerce, 37, 112
Philippines, 139, 157, 168, 176, 263, 313, 431, 436
Physical measurements in metrics, 310
Physicians (See Medicine)
Pilter, Sir John, 314
Pipe, 287 (See Manufacture)
Pisani, G. C., 351
Pittsburgh "Post", 154
Plunkett, Sir Horace, 371
Poincare, Raymond, 270

Poland, 272, 498, 504
Polk, Frank L., 263, 436
"Popular Magazine", 257
"Popular Mechanics", 259
Porto Rico, 157, 241, 313, 431
Portugal, 189, 406
Postal service, 29, 63, 157, 315, 393; frontispiece Map
Pradillo, A. E., 12
Pre-eminent Americans urge metric standardization, 136, 182-186
Preus, J. A. O., 263
Price, Colonel A. J., 313, 324, 334, 339, 345
Prime Ministers of Self-Governing Colonies of Great Britain, Conference of, 359
Printing, 310
Prizer, Edward, 191
Production—See Manufacture
Progress of the world, 41, 504-513
Propaganda blocking the metric advance—See Obstruction; German Propaganda
Publications, 254-262
Publicists, 251-253
Public Opinion—See Petitions; Demand

R

Radio telegraphy, 29, 75, 310, 512 (See also Electrical Industry)
Railroads, 41, 75, 393
Ramsey, Sir William, 289
Reconstruction and metrics, 420-424
Red Cross, 63, 109, 136, 156
Redfield, William C., 12, 33, 118, 120, 157, 182, 332, 338, 403, 408, 435, 439, 444, 465
Rees, Colonel Thomas H., 123, 124
Referendum of Chamber of Commerce of the United States, 17, 52, 508, 509, 510, 511
Reference Books, 439
Religious congregations, 240-242, 257
Report of the National Industrial Conference Board, 496-503
Retail trade—See Organizations, in Chapter 6 (Also 362, 365, 380, and elsewhere in Chapter 11)
Reynolds, Hans, 338
Richards, Howard, 11, 56, 118, 125, 177, 267, 478, 489, 490, 508
Richardson, Friend W., 267
Roberts, Frederic L., 12, 13, 513
"Roll Call of the Nations," 136
Roman numerals, 39, 125, 394, 438, 467
Roosevelt, Franklin D., 183, 436
Roosevelt, Theodore, 186, 260 (President of the United States)
Roosevelt, Theodore, 183
Root, Elihu, 186
Rosebery, Earl of, 371
Rotary Clubs, 96, 111
British, 364
Rowe, L. S., 11, 36, 110, 182
Royce, F. Henry, 356, 373
Rumania, 434
Russell, Charles Edward, 251
Russia, 32, 169, 271, 359, 392, 406, 497, 498, 503, 504, 505, 507, 509

S

Salt Producers' Association, 65
Salvador, 457
San Diego Chamber of Commerce, 88
San Francisco, 45 (See World Trade Club)
Sanger, J. W., 436
Scales and weights, 306, 307
Schanzer, Carlo, 187
Schieffelin, William Jay, 12, 56, 166, 325
Schieren, Charles A., 43, 207
Schmidt & Co., Carl E., 167
Schmidt, J. A., 228
Schools (See Education)
Schouler, James, 149
Schuhmann, George, 196, 490
Science, 60-63, 70-72, 73, 98, 219-221, 247, 311, 421, 446
"Scientific American," 256
Scientific Societies, South Africa, 361, 362
Scrapping of machinery will not result from metric standardization, 134, 135 (See Manufacture)
Scranton, Pa., Chamber of Commerce and Board of Trade Journal, 258
Screw threads, 261, 286, 341, 342, 344 (See Manufacture)
Seaman, W. H., 339, 347, 490
Search, Theodore C., 44, 186, 436
Selfridge & Co., London, 380
Sewing Machine Manufacturers' Association of the United States, 69
Seychelles, 357
Shaw, Sir Napier, 356
Shea, J. J., 47
Sherwell, G. A., 169
Shiels, Albert, 12, 81, 245
Shipbuilding Employers' Federation, British, 363
Shipping Board, U. S., 35, 138, 183
Shoe Wholesalers, 67
Shoup, Paul, 207
Shredded Wheat Co., 191
Siam, 436, 504
Siberia, 436
Siemens, Alexander, 298, 314, 316, 443, 491
Siemens, Sir Chas. Wm., 399, 400
Silk Association, British, 364
Simmons, Zalmon G., 12, 120, 190

Simplicity of metric units, 404, 406, 410, 416, 417, 429
Sims, Admiral William S., 183
Smith, Arthur Bessey, 12, 166
Smith, George Otis, 263, 436
Smith, Sam, 301
Smuts, General Jan, 37
Society of Civil Engineers of France, 115
Soldiers, Metric Manual for, 458 (See World War)
South Africa, 356, 361, 362
South America—See Latin America
Southard, J. H., 265, 456
Spain, 112, 406, 435, 462
Spargo, John, 251
Speyer, James, 185, 436
Spillane, Richard, 254
Sportsmen, 310 (See Athletics)
Standardization—See World Metric Standardization Council
Standardization of weights and measures as first step toward more general world standardization, 7, 121, 122, 320, 336, 339-345, 506-508
Stark, O. G., 309
Statistics, 12, 172, 185, 218, 266 (See Tables)
World Congresses, 390, 400, 468
Steel industry, 68, 185, 192, 193, 214, 292, 366 (See Carnegie, Andrew)
Stefansson, V., 253
Steinmetz, Charles P., 218
Stephens, Mrs. D. L., 137
Stephenson, George, 41
"Steward" magazine, 259
Stone, Charles W., 298, 315, 455
Strange names can be avoided, 315-317
Stratton, S. W., 21, 25-27, 295, 298, 304, 306, 312, 324, 328, 330, 352, 431, 457, 492
Stubbs, A. J., 297, 301, 314, 318, 332, 356
Sugar Manufacturers' Association, United States, 68
Sumner, Charles, 152, 161, 178, 185, 437, 451
Surgeons—See Medicine
Surveyors, British, 381, 382
Surveys, 306
Sutro, Theodore, 239
Swain, R. E., 12, 120, 127
Swedish Chamber of Commerce of the U. S. A., 70
Switzerland, 28, 109, 246, 266, 294, 295, 300, 315, 316, 406, 432, 462
Sze, Sao-Ke Alfred, 188

T

Tables of loss thru lack of metric standardization, 322, 323
Talleyrand, 22, 150, 429
Tally, British, 467
Tanners, 43, 167, 207
Tanners' Federation, British, 364
Taylor, Fred C., 12
Teachers—See Education
Technical progress, 421 (See Manufacture)
Telford, Fred, 309
Tennessee, 159, 262
Textbooks, 191, 311
Textile industry, 265, 302-306, 485
Textile Society, Bradford, 364
Tunis, 315
Turner, F. W., 307, 333, 349
Thermometers, 476
Thomas, C. S., 265
Thomson, Sir William, 125, 298, 356, 442
Tibbitts, H. C., 13
Time, economy of, 392-394
"Times," Los Angeles, 255
"Times," Washington, D. C., 256
"Tobacco," 259
Tokugawa, Prince, 187
Toronto Congress of the Chambers of Commerce of the British Empire, 353
Trading, 158, 322, 323, 325 (See World Trade)
Trade Reports, 459-467
Trades Union Congress, British, 362
Trade, World—See World Trade
Transition to metric units, ease of, 8, 294-302, 406, 432
Translation, 322, 323, 328
Transportation, 322, 323, 325, 326 (See Railroads, World Trade)
"Tribune," Chicago, 255
Truscon Steel Company, 192, 292
Turkey, 113

U

Unitannia, 137, 446 (Prize name-word to indicate all parts of the United States of America, and of Britannia)
Urgers—See "Who Urges?"
Uruguay, 457, 460
Use of metric units is universal, 157, 176, 177, 307-318, 336, 391-396, 493 (See Countries; Map Pages at front of volume)
Utah, 262

V

Vacuum Oil Co., 191
Vail, Theodore N., 186, 436
"Valve World"—See McEachren; also, Crane Company
Van Dyke, Henry, 184, 436
Van Karnebeek, Jonkheer H. A., 188
Vargas, Canuto A., 12, 109
Vashon, George B., 12, 120

Vauclain, Samuel M., 11, 165, 190, 281, 289, 290
Venezuela, 232, 414, 462
Vincent, George E., 185, 243
Vote of delegates to National Foreign Trade Convention, 139-141

W

Wade, Herbert T., 12, 173, 220, 290, 291, 293, 341, 342, 344, 449, 494
Wadsworth, C. S., 339
Wallace, Henry C., 225
Waltham Watch Co., 191
War—See World War; Army
War Mothers of America, 77
Washington Disarmament Conference, 186-189, 507
Washington, George, 148, 149, 150, 178, 185, 254, 452, 501
Washington, D. C., metric section, 513
Washington State Manufacturers' Association, 84, 128
Waste of Human Life, Time, Energy, 322, 323, 328, 352 (See Loss)
Watch industry, 28, 191, 194, 195, 196, 197, 202, 294, 364
Watt, James, 3, 8, 21, 39, 149, 150, 257, 321, 353, 354, 388, 428, 434, 446, 448, 467, 501
Weeks, G. F., 513
Weights, 306, 307
Weights and Measures Officials, 269
Weill, M., 204
Weller, Ovington E., 165
Wells, F. O., 12, 19, 289, 347, 432
Wells, W. C., 324, 332, 433, 494
Western Clock Co., 194, 195 (See Blow, Captain George P.)
West Indies, 357 (See also Cuba, Porto Rico)
White Engineering Corporation, J. G., 194, 292
Wholesalers urge metric standardization, 57, 58, 60, 61, 65, 67, 85
Who Urges Meter-Liter-Gram?, 53-117, 180-272, 444 (For British urgers, see Chapter 11)
Wiley, Harvey W., 12, 168, 508, 513
Willans and Robinson, 291, 299
Winder, C. D., 337
Williams & Cunnyngham, 192
Williams, Arthur P., 11, 56, 57, 120, 169
Williams Co., J. B., 192
Williams, Henry Smith, 251
Wilson, E. W., 10
Wilson, James, 157
Wilson, W. B., 264
Wilson, W. O., 44, 335, 486
Wilson, Woodrow, 330
Wireless, 310 (See Radio)
Wolfe, Clyde, 24
Wollmer, H. E., 314
Women, Organized, 77, 82, 98, 116, 243, 245, 365, 366
Wood, General Leonard, 184, 263
Word contest and prize, 137
Workshops to retain their own methods, 134, 135 (See Manufacture)
World Bureau of Weights and Measures, 157, 429, 467
World Chambers of Commerce urge metric standardization, 63, 112-116
World Metric Standardization Conference, 51, 55, 57, 120-142
World Metric Standardization Council, 9, 51, 53, 118-147, 171, 176, 180, 355
World Opinion, 269-272 (See Countries)
World organizations urging metric standardization, 63, 108-117, 468
World Trade, 28, 33-35, 45, 128, 132, 133, 154, 155, 157, 171, 261, 266, 271-272, 310, 311, 322, 323, 324, 328, 408-438, 459-467 (See also various Countries)
World Trade Club, 9, 36, 42, 45-52, 137, 170, 171, 180, 429, 436, 437, 444-446 (See Foreign Trade Club)
Applauded, 46, 47, 127, 129
Metric booklets, 46, 444
"World Trade" magazine, 45, 261
World Trade Museums, Philadelphia, 44
World War, 19, 20, 32, 33, 45, 153-158, 171, 238, 254, 264, 269, 308, 317, 320, 323, 327, 328, 346, 347, 354, 355, 426, 427, 498, 507

Y

Young, Sir Frank Popham, 131, 136, 355

THIS BOOK IS ISSUED BY POPULAR PURCHASE AND SUBSCRIPTION

It may be purchased at $5.00 a volume (cloth covers); $4.00 a volume (strong paper covers). Postpaid to any address in the world.

All purchasers of this volume are enrolled as Sustaining Members of the World Metric Standardization Council, without other fee.

The World Metric Standardization Council receives Cash Contributions for carrying on its educational work. Make all checks payable to the Council.

WORLD METRIC STANDARDIZATION COUNCIL

681 Market Street,
San Francisco

New York City Washington, D. C.

United States of America

London and Manchester, British Isles

Montreal, Canada

Correspondents thruout the World.

Printed By
Abbott-Brady Printing Corporation
San Francisco

This book should be returned to the Library on or before the last date stamped below.

A fine of five cents a day is incurred by retaining it beyond the specified time.

Please return promptly.

DUE MAR 26 1928

APR 17 1930

JAN 17 '62 H

Phys 429.22
World metric standardization:
Cabot Science 001920236
3 2044 091 885 269